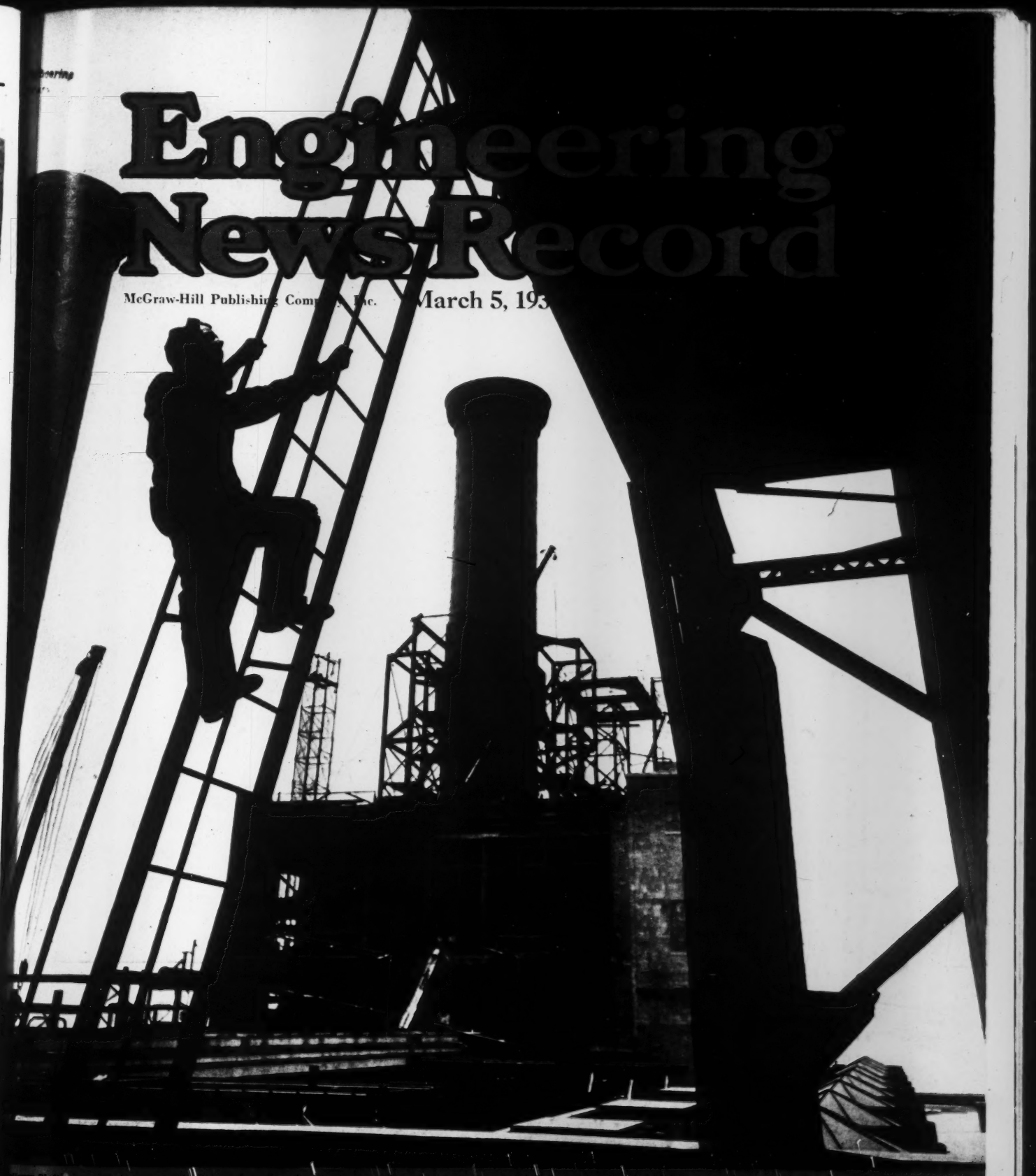

Engineering News-Record

McGraw-Hill Publishing Company, Inc. March 5, 193

Industry Builds Again

BEGINNING A SERIES ON NEW PLANT CONSTRUCTION

On the Leesville Dam in Ohio, this "Caterpillar" Diesel Tractor works with a bulldozer, helping to move 700,000 cubic yards of material.

FIRST FOR THE SCHEDULES! FIRST ON THE JOB!

When it comes to working out bids and schedules, you'll find that tractor costs are being figured more and more on the basis of what the "Caterpillar" Diesel Tractor can do—its low-cost operation and dependability make possible winning bids with an honest profit margin. When it comes to meeting the schedule and keeping the job moving smoothly, it's the "Caterpillar" Diesel again—hanging up records for low cost per hour, more working hours per day, more work per hour. It is FIRST on every count—get the details from your dealer. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

HERE ARE FACTS ON THE SHOW-DOWN

A Texas owner reports: "My 'Caterpillar' Diesel Tractor does the same work as my old gasoline tractor, but my fuel cost is now $1.20 per day, where it used to be about $7.70."

On the Mississippi Levee, a contractor reports that his "Caterpillar" Diesel has been hauling big loads from a drag-line at a fuel cost of only 15c per hour.

CATERPILLAR DIESEL

REG. U. S. PAT. OFF.

To RECONCILE *or to* REPUDIATE?

IN a recent issue this writer commented on "our effort to reconcile the three articles of our social and economic creed, i.e., consistent advance in the physical sciences, an economic system of free enterprise with vast integration of effort and a democracy of universal suffrage." A reader writes to suggest that this comment be somewhat expanded.

IT will be obvious that an abundance for all can be achieved only by first creating the abundance. This implies the highest attainable production of what men need per unit of human effort. However we may plan to effect a more desirable distribution of the world's goods, by no scheme can we distribute more than we produce, and the more we produce the more we shall have to distribute. So the first requirement of our creed is a consistent advance in physical science by which we may multiply our capacity to extract the natural resources and convert them to our use.

Next most essential is the useful application of that science, and here enters the human factor. Men respond to many incentives but experience has taught that self-preservation and self-interest are among the strongest instincts of the average man. On that fact we rely chiefly for the motive power that is necessary to apply knowledge to useful ends. Although continued ethical and social progress may in time generate other and even more effective incentives, we pin our faith for the time being to a system of free enterprise and individual initiative, one that will accord to the driving power of self-interest the largest possible freedom consistent with the general welfare. Under this system the function of government is to apply whatever safeguards may be necessary to conserve that welfare; it should not itself assume the operating management or control of productive enterprise.

But with the increasing scope and specialization of science and skill, with the complicated industrial agencies required to achieve efficient production on a practical scale, and with the complications injected into the process by finance and exchange, we require an ever broader and more complex integration of human energy and accumulated capital. And with disheartening regularity we are reminded that this essential regimentation of resources is still so imperfect as to cancel out periodically much of our technical progress and to thwart our efforts to make the most of it in the interest of all. Here is our most exacting task of reconciliation: we must contrive to make our science most serviceable to the greatest number and at the same time avoid any undue sacrifice of the driving power that is inherent in free enterprise and individual initiative.

To these must be added the third article of our creed, i.e., that government should be "of the people, by the people, for the people"—in short, a democracy of universal suffrage. Elementary as this doctrine may sound to Americans, it becomes more and more difficult to reconcile with the other two. More and more, as the people seek, through governmental intercession, to solve their economic and social problems, these problems become political problems. As such they are administered by politicians who rely for their guidance on mass-reactions, frequently emotional, and largely governed by short-term expediency or the pressure of organized minorities.

THIS statement of the problem implies no argument to strike out or abridge any article of our creed. This writer would not sacrifice any one of them; *but they must be reconciled.* Deliberately to curb the scientific progress that creates our abundance, to impair the driving power bred by free enterprise and by equitable individual rewards or to take from the common man the fruits of his age-long fight for political liberty, would be an acknowledgment of defeat and despair. Rather must we manage by consistent reformation of our system to reconcile them: to foster the march of science; to distribute our abundance more satisfactorily while we preserve the substance of economic freedom; to maintain the democratic ideal of government by keeping out of politics matters that can be referred to mass suffrage only at a disastrous price to all the people.

All this is easy to prescribe; it will not be easy to achieve. That is why such a reconciliation is the very essence of the problem that now confronts us.

Willard Chevalier

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In moving scores of miles of understreet gas mains for subway construction, New York City has never discontinued gas service or had a gas explosion. The practices by which this record of safety was obtained are described next week.

Offering **"HIGHEST BEAM STRENGTH COMPARED TO WEIGHT"**

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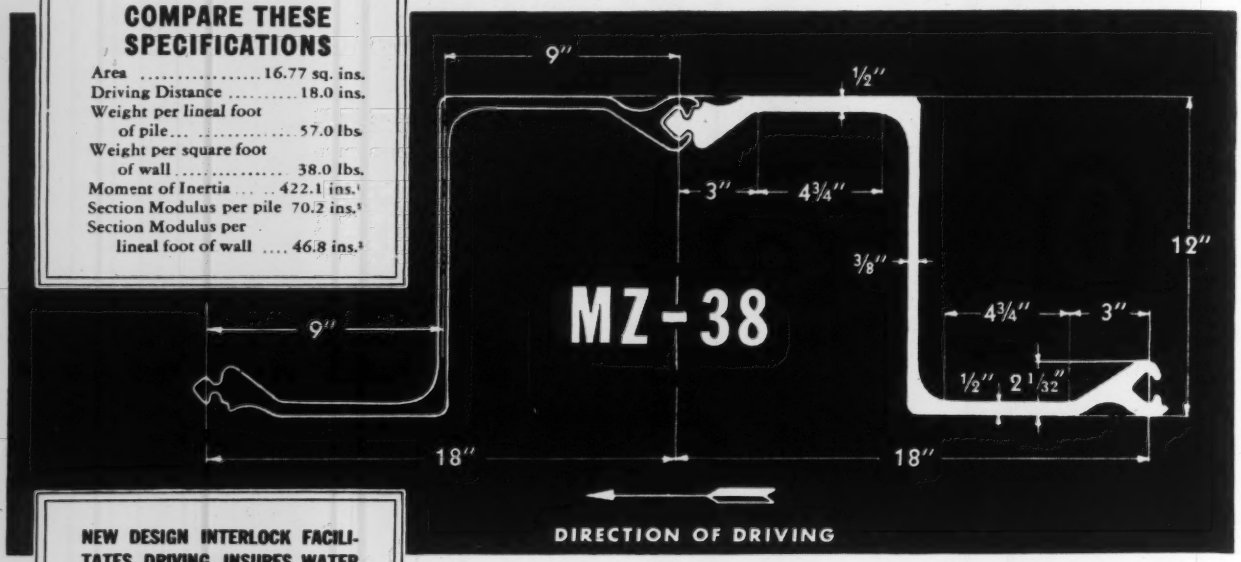
COMPARE THESE SPECIFICATIONS

Area	16.77 sq. ins.
Driving Distance	18.0 ins.
Weight per lineal foot of pile	57.0 lbs.
Weight per square foot of wall	38.0 lbs.
Moment of Inertia	422.1 ins.⁴
Section Modulus per pile	70.2 ins.³
Section Modulus per lineal foot of wall	46.8 ins.³



NEW DESIGN INTERLOCK FACILITATES DRIVING, INSURES WATER TIGHTNESS, PRESERVES ALIGNMENT

In this *improved* ball-and-socket interlock, a triangular shaped ball with metal balanced both on ball and socket ends introduces a double locking feature which gives maximum water tightness, reduces tendency of piling to creep and twist in driving, minimizes swing in the interlock, permanently preserves alignment.

Further, the concentration of metal in the triangular-shaped ball greatly reinforces ball against curling during hard driving and facilitates the use of long sections in hard bottoms.

INTERLOCK WELDING UNNECESSARY

Interlocks are located where longitudinal shear is zero—the section modulus of the single uninterlocked pile is thus the same as when interlocked. No welding of interlocks is necessary to prevent slippage due to longitudinal shear.

RUGGED TO RESIST BATTERING

Note the heavy concentrations of metal at the four exposed points. They stiffen the pile against battering, make it especially suitable for deep water structures.

A new, more economical construction for long spans and heavy lateral loads

IN introducing MZ-38—the first "Z" Piling to be rolled in this country—Carnegie-Illinois Steel Corporation offers you a Steel Sheet Piling having the highest beam strength for its weight developed to date. *Two-and-a-half times as efficient* as any sections produced in America. Considerably more efficient than "Z" sections produced elsewhere.

Consider these figures:—MZ-38 has section modulus per lineal foot of wall of 46.8 inches — yet weighs only 38 pounds per square foot of wall — 57 pounds per lineal foot of pile. The reasons are obvious why MZ-38 will assure particularly economical construction for wharves, piers, bulkheads, docks, sea-walls, canal locks and similar structures retaining heavy lateral loads over long spans.

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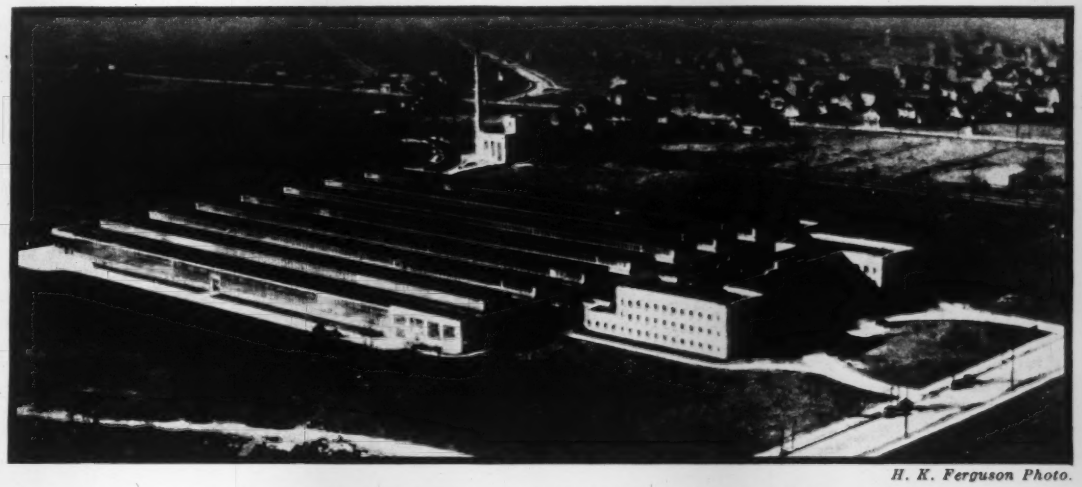
UNITED STATES STEEL

ENGINEERING NEWS-RECORD

March 5, 1936



H. K. Ferguson Photo.

FIG. 1—MODERN INDUSTRIAL PLANTS, like Caesar's Gaul, are divided into three parts—the office building, the factory and the power plant.

Enclosed Acreage

Industry builds new plants after a five-year layoff, and most of them are better than the 1929 variety, and some are distinctly new and different

INDUSTRY is building again. The 80 per cent gain which the past year registered over 1934 created a volume of $172,462,000 in mills, factories and warehouses, a total not equalled since 1931, when a similar investment was made in plant as a milestone in the great decline from the $550,000,000 top in 1929.

What do these new expenditures mean? Why were they made? What is being built with them? Particularly, what is being built with them?

An inspection of a dozen of these new plants located in eight different states and visits with the company executives, the architects and the engineers who have shouldered the responsibilities of recommending the expenditures and developing the plans gives a fairly definite answer. Industrial buildings—1935 model—are mostly better than those which were being built in 1929. Some of them are distinctly better, and a few are radically different. Practically all contain details in such elements as floors, roofs, walls, partitions, lighting and ventilation that reflect the results of sober thinking during the five-year layoff when maintenance charges were eating up capital surpluses.

An 80 per cent increase in industrial buildings at the present time means that the objective of all of the attacks on the depression—the revival of the durable-goods industries—is finally being realized. Just why industrial construction has been so slow in getting started is a problem with which the economists will wrestle for a long time to come. They saw it rise encouragingly in 1933, only to drop off again when the brewery bonanza proved to be a mirage. A similar experience characterized 1934, when distillery construction gave the contract figures a rousing fillip. When in March, 1935, industrial contracts again began to mount, there were few brave enough to predict that the recovery had really begun. But it soon became apparent that this was no bubble blown up by a single industry. While the automobile industry and its material suppliers were dominant in the new factory-building activity, they were aided by industry on a broadfront—foods, chemicals, construction materials, drugs, furniture, textiles, oil and airplanes taking part in the expansion.

The reasons for the new industrial building investments are naturally varied. Prospects for new markets, as exemplified by the new diesel locomotive plant of General Motors, by numerous chemical plants and by new can-making facilities for beer containers; changing customer requirements, as exemplified by wide-sheet rolling mills and cold-rolling facilities, to provide steel for automobile bodies and furniture; the desire of companies that have developed new building products to give them a field trial in their own plants; all these are among the reasons for industrial expansion. The need for modernization of plant run down after five years of semi-idleness, for new capacity to take care of increasing markets, for decentralization to tap new markets or to provide manufacturing facilities nearer the center of the exist-

FIG. 2—ONE-STORY PLANTS as exemplified by the new Chevrolet assembly facilities at Baltimore, are industry's choice for straight-line mass production.

ing market, also account for some of the new building.

Finally, but by no means least important, is the desire to provide better working conditions for employees, particularly plant clerical forces, heretofore often housed in dusty noisy quarters in the plant or too near it for comfort. It is in these plant office buildings that the much-talked-of air-conditioning is making its greatest current advance, although isolated departments in the plant itself are also being equipped for air-conditioning when the manufacturing process requires it.

In summary, the consolidated reason for increased industrial plant building is to make a profitable investment. Neither philanthropy nor fear of taxes play any discernible part. Business opportunities loom on the horizon, and new plant is needed to convert them into cash.

The engineer, the architect, the contractor, the materials manufacturers and the prospective owners are interested in the product of this new building investment. What new concepts are involved? What new materials are being used? What are some of the accepted details of good practice?

Individuals Contributing to the Series

C. W. Bennet, J. E. Graf, J. M. Darbaker, W. G. Hoffman, H. L. Anderson, E. M. Feiger — *American Sheet & Tin Plate Co.*

W. J. Austin, George A. Bryant Jr. — *The Austin Co.*

Timothy Burns, W. A. James, John C. Long — *Bethlehem Steel*

L. C. Childs—Battey & Kipp, *Architects*

William A. Hanley—*Eli Lilly Co.*

H. K. Ferguson—*H. K. Ferguson Co.*

John R. Fugard—*Architect*

V. E. Vallet, O. H. Pocock — *Giffels & Vallet, Architects*

J. B. Jackson, F. H. Linscheid — *General Motors*

D. P. Witmer, A. B. Snavely — *Hershey Chocolate*

Albert Kahn—*Architect*

A. G. Hopkins—*National Can Co.*

Thomas Almroth—*Owens-Illinois*

John Hulst—*U. S. Steel*

Better and bigger

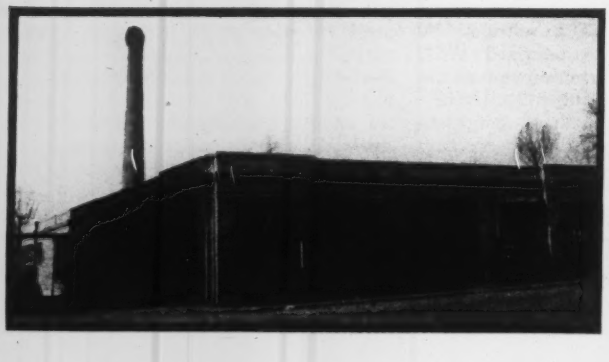
Fundamentally, industrial buildings may be characterized as "enclosed acreage." Twenty-five years ago most of them were stripped to the bare essentials that this term implies, the enclosure being made rainproof and little else. Today the buildings of industry are substantial structures of durable materials, even the prosaic mill-building exhibiting trends of improvement. Twenty-five years ago the acreage under one roof at any plant was relatively small. Today, to take only one example, the new rolling mill of the American Sheet & Tin Plate Co. at Gary, Ind., has 45 acres under a continuous roof.

This enclosed acreage in any one plant divides into three principal elements—the factory itself, the office building and the power house. The plant office building, which has probably exhibited the greatest improvement or at least the largest variety of change during the past five years, will be considered in a subsequent article. Broadly, office-building trends include complete physical separation from the factory building, multi-story construction up to a maximum of four stories, so that elevators are not required, modern architectural appointments and air-conditioning, with its attendant demands for better insulated walls and roofs. The power plant, always a well-built structure, has been architecturally embellished but otherwise has had to yield little to the march of progress. Improvement in power-generating equipment has of course been phenomenal, but here we are concerned only with the housing. The factory itself remains to be considered.

Factory planning

The ideal factory, it has been said, would reproduce outdoor conditions as

FIG. 3—OLD AND NEW PLANTS of the Allison Engineering Co., Indianapolis, reflect both growth and changing customers. Formerly a racing-car machine shop, the plant will now build and test airplane engines.



Plants Referred To in the Series

Allison Engineering Co.
American Sheet & Tin Plate Co.
Bethelehem Steel Co.
Briggs Manufacturing Co.
Chevrolet Motor Co.
Chicago Vitreous Enamel Co.
Continental Can Co.
Dryden Rubber Co.
Eli Lilly Co.
Ford Motor Co.
General Motors Corp.
Hershey Chocolate Corp.
Kelsey-Hayes Wheel Co.
Maytag Washing Machine Co.
National Can Co.
Owens-Illinois Glass Co.
Sharon (Pa.) *Herald*
U. S. Steel Corp.
Youngstown Sheet & Tube Co.

to temperature (in a mild climate), sunlight and freedom from artificial obstructions. Leaving aside those special cases where nature is improved upon by artificial illumination and air-conditioning, industrial buildings tend more and more toward larger areas of glazed walls, monitors and skylights, toward better ventilation facilities and toward wider column spacing. Bays of 60 ft. are not uncommon, and some of 100 ft. have been built, though 40 to 50 ft. is most generally acknowledged as economical maximum spacing. An example is the new Chevrolet assembly plant at Baltimore, 600x980 ft. in plan, with columns spaced 40 ft. in both directions.

The trend continues toward the one-story plant. There are exceptions, but the only general one concerns plants at tidewater or along certain navigable rivers where the high cost of pile foundations favors small plots and dictates multi-story construction. The one-story plant eliminates the need for elevators, which take up valuable space and contribute to inefficiency, since men and materials are constantly waiting for them; in multi-story buildings where elevators are necessary, good practice places them as near the outside walls as possible, to eliminate approaches which waste space in the building. A comparative study made by the Austin Co. of single and multi-story buildings of the same floor area reveals that there is about five times more wasted floor space in the multi-story structure, that the required construction time is greater, that the total cost is greater, and that the cost of usable floor area is 25 per cent more per square foot. The savings in favor of the one-story building that these figures demonstrate, coupled usually with reduced operating expenses, are back of the growing acceptance of this type of factory.

Complicated or trick designs are anathema to the industrial-building owner and planner. "Make them simple," says Albert Kahn, Detroit architect. "Design industrial buildings as an assemblage of identical units for simplicity and easy expansion," says W. J. Austin.

To the element of simplicity, H. K. Ferguson, of Cleveland, would add standard designs. "Standard designs are necessary because industrial buildings are always wanted in a hurry. Furthermore, some kind of a standard is necessary as a base upon which to make improvements. It is much better to refine a standard product than to attempt to embark upon a radically new, though theoretically improved product."

Flexibility of service, or adaptation to other than the original purpose of the buildings, is another objective of modern practice. Wide column spacing and one-story construction contribute to this ideal. F. H. Linscheid, of the Argonaut Realty Corp., General Motors subsidiary, relates how numerous good but obsolete buildings in Detroit, less than 20 years old, have had to be razed because they could not be adapted to modern motor-car manufacturing requirements. General Motors' regional warehouses and service buildings are built with truss spans and without interior columns when possible. Where columns are necessary, the spacing is 25 to 27 ft., based upon the fact that this width will accommodate three cars, if work is to be done on them, or four cars if they are merely being stored. Thus the building is immmediately available for either type of occupancy.

FIG. 4—FOUNDATIONS for the new Bethlehem steel-plate mill near Buffalo, shown above, indicate the size of the areas being enclosed in the plants now under construction.

FIG. 5—A NEW PRODUCT—diesel locomotives—brought the new plant shown at the left into existence. It is the plant of the Electro Motive Corp. at McCook, Ill.

General planning also involves consideration of utilities such as washrooms, locker rooms and toilets, heating, ventilation and lighting. The last two, ventilation and lighting, are corollaries of wall, window and roof requirements discussed later. Heating is largely by means of high-velocity steam-unit heaters often suspended from the trusses so as not to obstruct the floor space. Washrooms and locker rooms are large, well lighted and airy, and are being improved in all of these particulars with almost every new plant. Toilets have come in for a great deal of study, first to keep the rooms from occupying valuable floor space and, second, to place them so as to conserve the workman's time. Albert Kahn has standardized on a 150-ft. spacing,

so that workers have to walk only 75 ft. from their machines. Also, since ceiling heights usually are 12 or 13 ft., he has developed a tier design with one toilet room above another. H. K. Ferguson and others have utilized the space between roof trusses and monitors for toilets, leaving the floor free for manufacturing operations.

The well-known trend toward making plants safer for workers is usually identified with the machinery and not the building. However, in the Bethlehem Steel Co.'s new steel mill at Lackawanna, N. Y., near Buffalo, safety features are incorporated in the structure; stairways rather than ladders are provided for the crane operators to use in reaching their cabs, the stairways terminating in wide railed platforms. Space is also provided for a walkway between the crane girders and the building columns for the use of inspectors, window cleaners and painters, and similar walkways are installed in the monitors.

Finally, a tendency to consider the external appearance of industrial plants is beginning to appear. Facade combinations of brick, glass, stone and concrete are being used more carefully. Proportioning of copings and parapets receives consideration. The Austin Co. has urged for some plants the use of a modernistic treatment of functional horizontal lines, including the emphasis of certain masses of masonry or windows. General Motors has rather cautiously embraced some of these ideas in its Electro Motive Corp. plant at McCook, Ill., and its Allison Engineering Corp. plant at Indianapolis, and with good results and little additional cost.

FIG. 6—WELDED FRAMING provides a modern note in the Electro Motive Corp. plant consistent with the company's modern products, diesel locomotives.

One-story factories are invariably of steel, multi-story factories are more often of concrete. The reasons, no doubt subject to exception, argument and amendment, are that the desired wide column spacing of one-story buildings, dictating the use of roof trusses, makes steel more suitable and economical. In tier buildings, the desirability and usual economy of flat-slab concrete floors dictate the use of concrete columns spaced 23 to 28 ft.; for the heavy loads in multi-story buildings concrete construction is said to be more economical. According to Mr. Linscheid, all General Motors one-story buildings and some two-story buildings are of steel. In two-story buildings where ramps are common and floor loads apt to be heavy, concrete frames are preferred. Steel frames are seldom fireproofed, only two out of 36 General Motors branch buildings having the steel so protected; in these the fireproofing material is poured gypsum. The Eli Lilly Co., pharmaceutical and biological manufacturers of Indianapolis, with some 12 acres of floor space in three- and four-story tier buildings, uses concrete construction, flat-slab floors and column spacing of 18 to 20 ft. on its new as well as its old buildings.

A different viewpoint from that held by many as to the economy of the flat-slab concrete building is exemplified by the work of Brown & Matthews, Inc., Builders, of New York, which invariably is carried out in steel framing. An interesting example of this practice is reflected in a new plant being built for the National Can Co., McKeesport Tin Plate subsidiary, at Baltimore, to designs

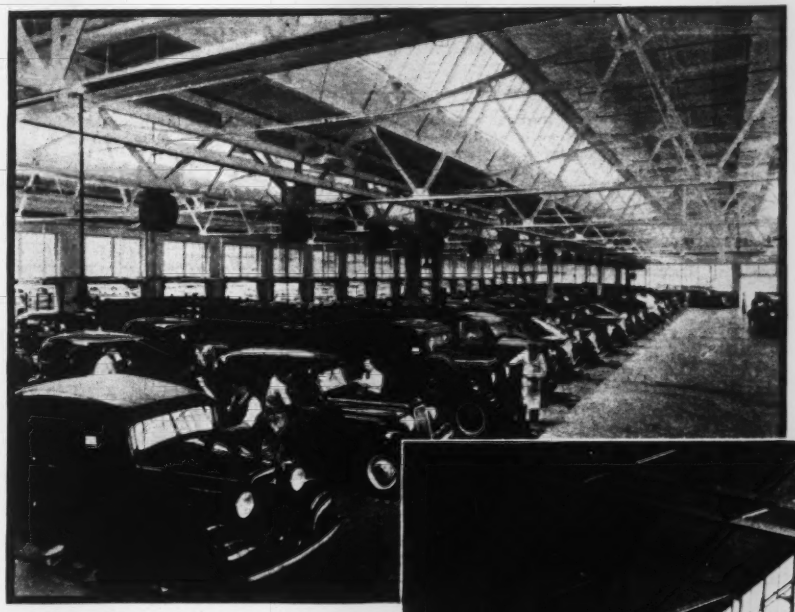
FIG. 7—T-COLUMN RIGID FRAMES supporting a cellular steel roof deck give the Elwood, Ind., plant of the Continental Can Co. a new and striking appearance.

made by the National Can Co.'s engineering department. The job consists in replacing an old four-story brick bearing-wall building on tidewater with a modern four-story structure, without interrupting manufacturing operations, which center on the new type of beer containers.

In 1934 the walls of a 33x111-ft. building on the corner of the plot were found to be in such dangerous condition (after 125 years of service) that they could no longer carry the floor loads. Accordingly, these loads were transferred to a new steel frame built inside the building while manufacturing operations continued; a difficult part of this reconstruction was the driving of steel tube piles for new column footings, working in the cramped quarters of the basement. The frame was part of a new plant planned to be started a year later, and in November of last year work on this reconstruction was actually begun. The old brick walls of the corner building were removed, exposing the frame, and new floor steel was added. On an adjacent plot another unit of the old plant was torn down and a new steel frame erected. As this new portion is completed, manufacturing operations will be moved into it, permitting demolition of another unit of the old plant. The old corner building with its new steel frame and the ultimate 128x178-ft. plant are shown in Fig. 9.

Complete rebuilding will take place between November, 1935, and June, 1936. In the opinion of Brown & Matthews, Inc., such an operation is much more readily and rapidly handled with steel than with concrete.

Column spacing in one-story buildings, as previously noted, is tending toward 40- or 50-ft. bays in the interior of the building. Spacing of half these amounts prevails for wall columns where windloads on masonry, corrugated metal or steel sash walls are controlling. The 40- or 50-ft. interior column spacing requires roof trusses, which are usually more costly than rolled beams, although they can often be combined with monitor construction with a consequent saving in steel. Trusses are also advantageous as supports for pipes, ducts, shafting, etc., and they usually are strong enough to carry bottom-chord platforms for storing miscellaneous materials or supplies.



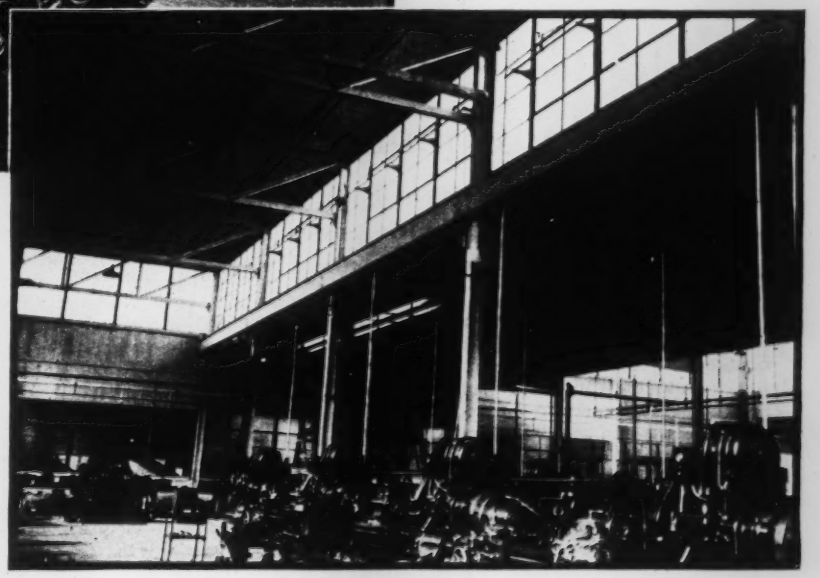


FIG. 8—TRUSS AND MONITOR framing is susceptible of much variation, as illustrated by the Chevrolet plant at Baltimore (above) and the Allison Engineering Co. plant at Indianapolis.

An interesting departure from roof-truss framing is made in the new plants of the Continental Can Co. at Elwood, Ind., and the Dryden Rubber Co., at Chicago, where rigid-frame bents made up of rolled sections are used. In the Continental Can Building, a 100,000-sq.ft. one-story structure, the bents have 30-ft. spans and are spaced 20 ft. on centers. The columns and a 10-ft. length of beam are shop-welded into T-shaped members. Beam splices are made by rivets. Over the lines of columns, transverse to the 30-ft. bent spans, are continuous lines of A-frame skylights. The architects, Battey & Kipp, of Chicago, who have applied for patents on this T-column design, include among its advantages improved appearance, reduced volume of roof structure, easy erection, flexibility in locating monitors, shallow beams by virtue of continuity and a large amount of duplication in the fabricated members. All piping and electric conduits are carried above the lower flange of the beams out of the way of manufacturing operations. Also, roof drainage is brought to inside down-spouts that are set between the flanges of the columns. Framing of T-column design also lends itself to future extension (as is planned at the Dryden Rubber plant), since welded beam stubs can be attached to the wall columns without disturbing the columns or their foundations.

Mill-building framing consisting of wall columns, roof trusses and crane girders is not of a character that invites or even permits much change from past practice. Although mill machinery has changed, it has had little effect on the buildings, which have always had high roofs for crane clearances and ventilation and have wide spans, since there are no interior columns.

The unusual size of some of the new buildings is, however, of passing interest. At Gary, one of the new American Sheet & Tin Plate Co. buildings, is a structure of 120-ft. span 2,600 ft. long. At the new Bethlehem plant at Lackawanna a 105-ft.-span building extends for 1,100 ft. continuous with an 87-ft.-span building 600 ft. long, and there are seven other buildings of 105-ft. span having lengths of 600 to 1,000 ft. Column spacings in these two plants are 24 and 25 ft., respectively. Another item of structural interest in these mills

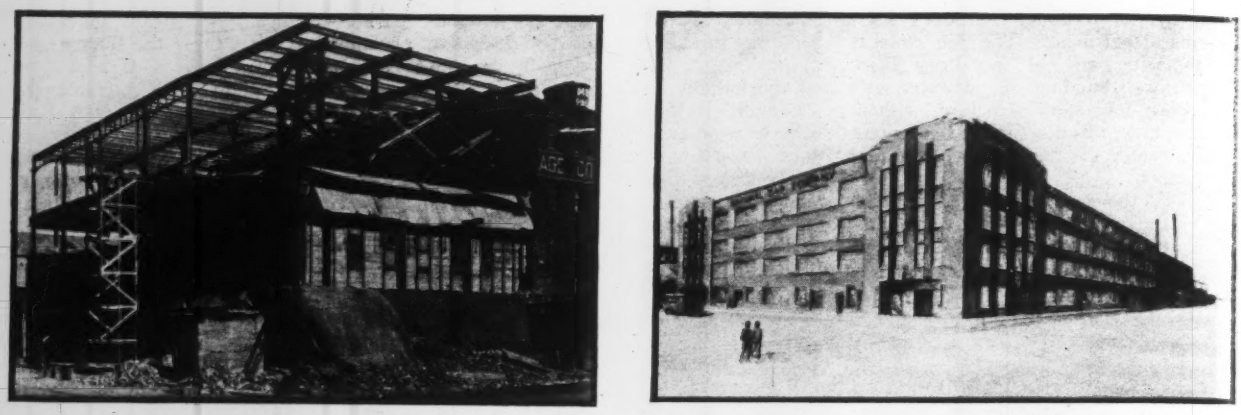


FIG. 9—UNIT REBUILDING of a plant while manufacturing operations continue is exemplified by work under way for the National Can Co. in Baltimore. The steel frame at the left was built before the brick walls were removed. A feature of the eventual plant, shown in the rendering at the right, is the use of glass block pilasters to supplement the steel sash as light sources.

is found in the wide-span wall openings used at the points where the sheets are transferred from one building to another. At Gary one of these openings is 216 ft. wide and is spanned by a heavy parallel-chord truss. A similar opening at Lackawanna is spanned by a 125-ft. three-web box girder 140 in. deep.

One innovation in mill-building framing is recorded in the Electro Motive Corp. plant near Chicago, where all of the 2,600 tons of structural steel required is welded. The main erecting shop has a roof span of 100 ft., and an adjacent machine shop has a span of 64 ft.. The welded crane girder which is used in the erecting shop of the Electro Motive Corp. supports three cranes of 200,- 40- and 30-ton capacity, respectively.

* * *

Article II, to be published next week, describes the wall, floor and roof practices used on some of the country's new industrial buildings.

Movable Bridge Patents Discussed by Committee

Digest of all such patents since 1890 shows expiration has destroyed legal basis for infringement suits—Designers advised to read claims of expired patents

BECAUSE of the patent situation the interest and efforts of many engineers lessen as soon as a proposed bridge gets into the "movable bridge" class, according to the report of a committee of the San Francisco Section of the American Society of Civil Engineers presented Dec. 17, 1935. This committee examined and made a digest of all movable bridge patents issued since 1890. Its report advises bridge designers to examine the patent claims that have expired and to refuse to be intimidated into payment of royalty where there is no just basis for such charge.

Some time ago the status of movable bridge patents was brought to the attention of the San Francisco Section by structural engineer members who asked for an investigation and report. It was believed that publication of the facts might protect communities against ill-founded claims for royalties and fees. Three well-known structural engineers of San Francisco, Leon H. Nishkian, W. E. Emmett and Harold B. Hammill, were appointed to make the investigation. Later a fourth member, Robert L. Skov, was added to the committee.

The first move was to obtain from the U. S. Patent Office all patents relating to movable bridges from 1890 to date. More than 150 such patents were located and copies obtained. After a general classification of these patents and discussion of the best distribution, each member of the committee was assigned part of the collection to be read, analyzed and digested from the point of view of what bridge designers would want to know about it.

Some of the patents were found to be wholly impractical and of no significance; others contained claims that seemed to be deliberately intended to confuse. A common practice noted was the scheme of describing an entire bridge structure and wording the description so that the reader would be led to believe that all matters described were covered in the patent. "Only by very careful reading and study is one able to separate the feature that is being patented. Many of the patents are drawn in this manner, and we call special attention to this in order to put the reader on his guard," says the committee report.

The general classification of the patents examined by the committee was as follows:

Class	No. Patents Examined
Bascule bridges:	
Simple trunnion	35
Vertical counterweights	13
Counterweights and pivoted links	10
Swing bridges	4
Rolling bridges	18
Lift bridges	22
Miscellaneous	19
Not pertinent	30
Total	151

Two principal conclusions were reached from analyzing this list and comparing notes on the typical traits that characterize many of these patents: (1) Most of the fundamental patents were issued prior to 1918, and since the life of a patent is only seventeen years they have long since expired—some of them more than a decade ago. (2) It is important that bridge designers familiarize themselves with the claims of expired patents, as this is the best protection against patent intimidation. Such a study of expired patents may be undertaken in the expectation of finding that many claims for royalties are not valid. Patents have expired on all commonly known types of movable bridges.

The committee's report, presented under date of Dec. 17, 1935, includes a list of movable bridge patent numbers together with name of patentee, dates of filing, issue and expiration and a brief digest of the claims made in each patent. The committee hopes that this compilation of information "will help to bring about more ethical conditions in the design and construction of movable bridges."

Spillway Gate Model Supplements Calculations

Experimental study of handling of large lift gates of Bonneville Dam is being carried out on one-tenth scale model equipped with complete operating mechanism

By R. R. Clark
Engineer in Charge of Spillway Dam Design, Bonneville Power Project

THE SPILLWAY DAM under construction across the main channel of the Columbia River as part of the Bonneville project is designed to pass a maximum flood-flow of 1,600,000 sec.-ft. This is the combined capacity of eighteen spillway bays, each 54 ft. wide. The flow through these bays is to be controlled by lift gates fitted with roller-bearing wheels, each designed for a load of 200,000 lb. Each gate will consist of two panels or sections that will be raised and lowered by direct lift from a 350-ton gantry crane. The gate sections will each weigh 262½ tons. A daily river fluctuation as high as 200,000 sec.-ft. at the Bonneville site makes it desirable to develop gate-operating mechanism that will be thoroughly reliable under all conditions.

FIG. 1—ONE-TENTH SCALE spillway gate model seen from downstream. The dimensions given are for the full-size gate.

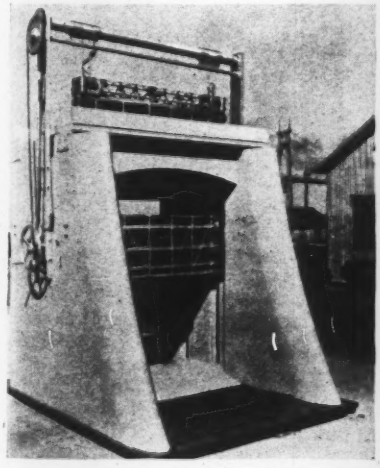


FIG. 2—LOWER GATE SECTION may be latched in place while upper section is raised.

As the operating mechanism for handling these gates involves a number of practical problems, it was considered worth while to build a mechanical model so that working tests could be made. Estimates indicated that a completely equipped operating model to one-tenth scale could be built for about $5,000. As the cost of the full-size gates and cranes will be about $1,500,000, the cost of the model represented only one-third of 1 per cent of the investment in the prototype equipment.

Accordingly, a mechanical model was built and is being tested at the hydraulic laboratory established near Portland to develop hydraulic data in connection with the design of the Bonneville project. Facilities are there available for producing flows and variations in flow that will simulate conditions at the spillway dam.

In the model a hand winch with cable drops simulates the action of the gantry crane and takes the place of all mechanism above the lifting beam. The connections for attaching to and picking up the gate, however, were worked out in detail for the model and permit of experiments on various phases of operations.

Fig. 1 is a downstream view of the model with both sections of the gate lowered and the lifting beam in position for raising the gate. The dimensions given in this figure represent the dimensions of the prototype. The piers in the model are made of wood and have a metal track in the slots for the gate wheels. The gate itself is made of steel, with all mechanical parts to exact scale. On the pier at the right, above and beyond the gate, can be seen the emergency gate slot. This is upstream from the operating slot and is designed so that it will receive the upper section of the gate when flood-water conditions are such as to require maximum opening.

Fig. 2 shows the gate in partly raised position with the two sections separated. This is not an operating position, but it illustrates the possibility of latching the lower section in place while the upper section is moved independently. Latching mechanisms are mounted in pits concealed in the piers. In the model they are actuated by hydraulic pressure transmitted through a rubber tube from a movable tank to a cylinder on the arm of the latch. In the prototype operation is effected by a thrustor, an electric device similar to a solenoid magnet, which is mounted in the pit and is attached to the arm of the latch. The thrustor at all times is under the control of the crane operator.

Fig. 3 illustrates the mechanism on the lifting beam for engaging the hook which is on top of the gate. This mechanism will engage the double hook of the gate automatically when lowered to position in the proper way. The upper view in Fig. 3 shows the position just before the beam reaches the level at which the hook arms engage the hook; the middle view shows the hook arms engaged and ready to lift, while the bottom view shows the mechanism after having been lowered a short distance to release the load. In this third position the arms are locked open so that when raised they will clear the hook. When raised clear of the hook, the arms can be tripped so as to hang vertically, ready to be lowered again into position for lifting.

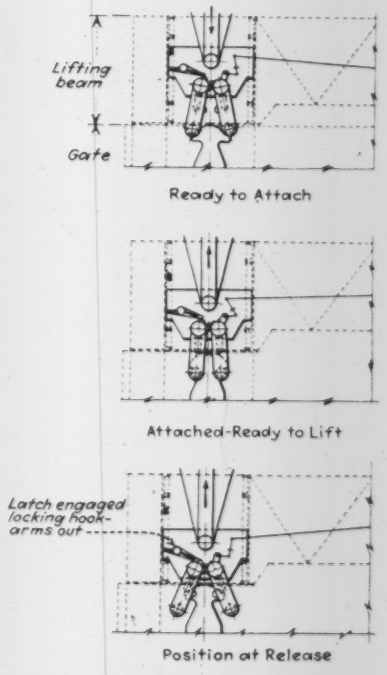


FIG. 3—SHACKLES on the lifting beam automatically pick up the double hook on the gate when the lifting beam is lowered; further lowering of the beam trips the shackles and latches them clear of the gate hook, so that the lifting beam can be hoisted away.

Removing Fines From Sand With Air Blowers

Concrete aggregates used on Colorado River Aqueduct have an excess of fines, which called for improved methods of dry separation—Moisture content should be below 1 per cent

By John Stearns
Division Engineer, Division 3, Metropolitan Water District of Southern California

ALONG the Colorado River Aqueduct, now under construction by the Metropolitan Water District of Southern California, water for use in construction operations is neither plentiful nor cheap. Wherever materials for use in making concrete have been developed along the job, a large percentage — frequently an excessive amount — of fines has been found. If these fines had been in the form of clay or had included organic matter, perhaps economical separation by air blast would not have been possible. Fortunately, the fines consist largely of a dry silicous dust, and after overcoming initial difficulties the process of removing fines by air blast has been carried on so satisfactorily that this is now the accepted method all along the line. Successive steps in the development and improvement of the separation processes and an outline of the methods now employed are given in the following.

The initial installation on the aqueduct for air segregation of fines was at Wide Canyon camp. From this point some 11 miles of the aqueduct tunnel had to be lined, calling for about 175,000 cu.yd. of aggregate. Because of the excessive amount of fines in the materials available, study was concentrated on this problem at the outset.

At the sand pits developed here, 12 to 14 per cent of the "sand" (everything that would pass a ⅜-in. screen) consisted of fines that would pass a 100-mesh screen. To meet specifications, it was necessary to reduce these fines to less than 9 per cent. The method tried first was to suck the dust out of the sand and pea gravel while these two grades were being separated on a vibrating screen. The screen was 42 in. wide and 12 ft. long, but only 3 ft. of the length was covered with the suction hood. The hood extended over the full width of the screen, and within it was maintained an updraft of air intended to remove the dust by the suction process.

Experiment at Wide Canyon

The equipment used in this first experiment consisted essentially of a blower exhausting from an intake in the dust hood over the vibrator screen. From this hood a 14-in. duct led to a vertical cylinder 5 ft. in diameter, whose bottom was in the shape of an inverted truncated cone. Centrifugal force resultant from a tangential path of entry into this cylinder threw the heavier particles toward the periphery, and thus they tended to fall by gravity around the edges of the cylinder. Meanwhile the air outlet from the cylinder was in the form of an updraft from the cylinder's central region. Coarse material thus passed downward through a vertical pipe at the bottom, and fines were sucked out in the updraft.

Analysis of sand after treatment by this device showed that the 12 per cent of dust had been reduced materially. Some reports claimed the reduction was

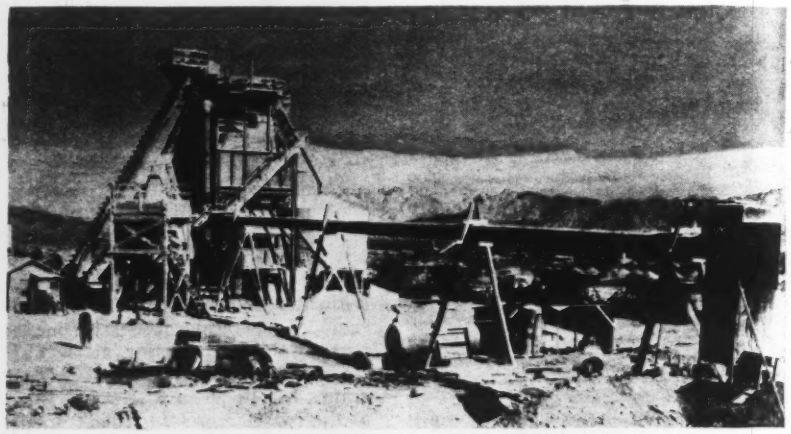


FIG. 1—AGGREGATE PLANT at Division 3 headquarters. Equipment for blowing out fines discharges through the 22-in. pipe in the foreground.

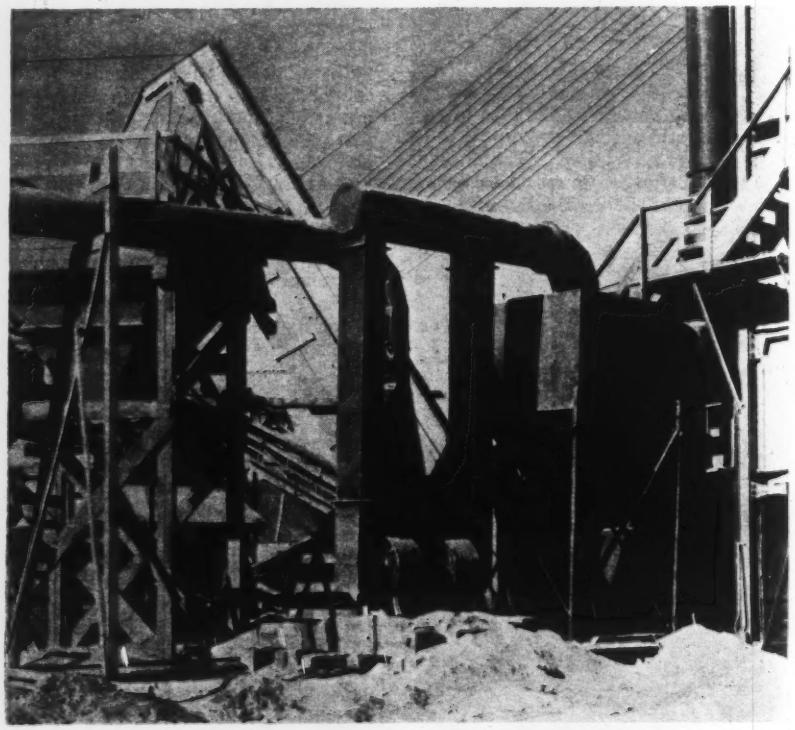


FIG. 2—TWIN FANS suck dust from the separation unit and discharge through a 22-horizontal pipe at the left.

ess than 7 per cent. In three 8-hour shifts an ordinary run netted about 250 cu.yd. of screened sand and about 12 cu.yd. of dust in the dust collector. Analyses of the dust removed showed about 10 per cent of it to be coarser than the 100 mesh. The high-pressure type of exhauster fan used in this installation had a capacity of 5,000 cu.ft. per minute and induced a draft at the intake equal to a vacuum of 8 in. of water.

To some extent this was a solution of the problem as to reduction of fines, but loss of the 10 per cent of plus-100 material was objectionable. Moreover, the process proved to be expensive in the long run, because by sucking instead of blowing, dust was drawn into the machinery with resultant excessive wear on bearings. Although the vacuum process was used for some time, experiment was directed toward changing to equipment that would blow rather than suck. Before long the initial dislodgment of the fines was done by blowing rather than sucking. In time this came to be the exclusive means for the actual segregation of the fines, although a suction draft continues to be the more convenient means of moving them in at least some stage of their transportation, in all the plants.

One of the fundamentals discovered early in this development program was that the proper place to extract the excess of fines is where the pit-run material enters the aggregate plant. By applying the separating process at this point, fines that cling to the larger aggregate sizes are subjected to the process of separation, thus removing fines that otherwise would go into the mix with the coarse aggregate.

Careful observations are made on moisture content of pit-run material. Where the moisture content is as high as 2 or 3 per cent, segregation by blowing becomes difficult, sometimes impracticable. With moisture content below 1 per cent the process can be maintained on an effective operating basis. The several stages of the process require to be observed, and adjustments in operating plan are necessary from time to time.

Essentially the problem is to remove from the aggregate a considerable percentage of the fines that would pass through 100 mesh, and at the same time to avoid removal of any of the plus-100-mesh material. The average source of aggregate along the aqueduct contains only about 12 per cent of fines between 48 and 100 mesh, whereas 15 to 16 per cent of this size would have been the ideal combination. After introduction of the trays on the under side of the 22-in. pipe in which the fines are blown away, it was found possible to recover the small percentage of the plus-100 material that otherwise would have escaped.

Although the details of methods differ at different camps, in general

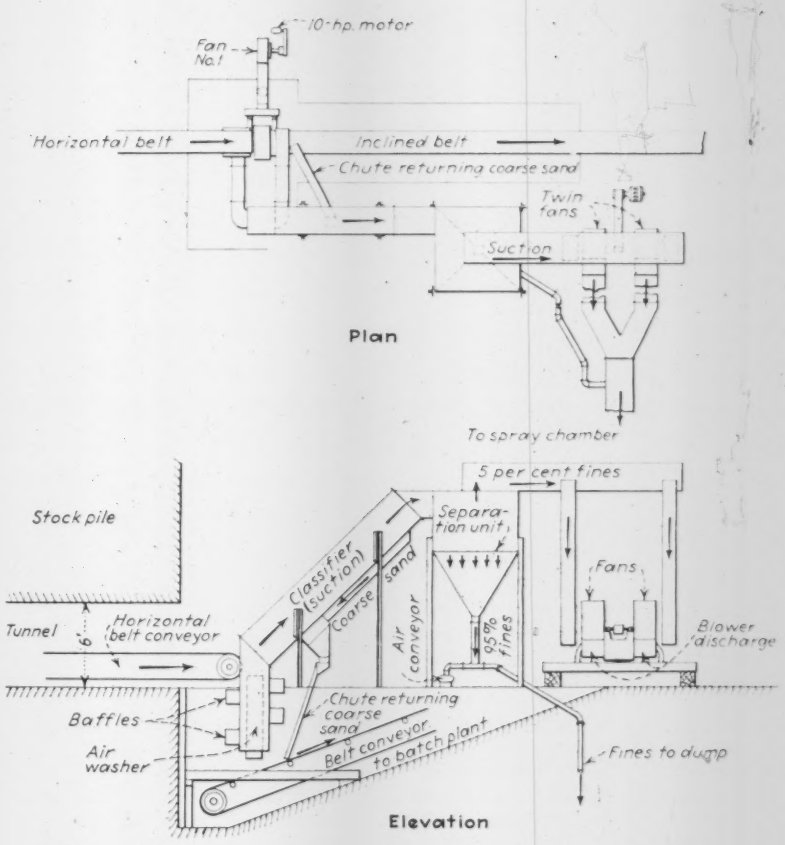


FIG. 3—SKETCH showing arrangement of mechanism at East Iron Mountain for dry cleaning dust from sand to be used in concrete

the principle of the air segregation involves an updraft or blast of air upward through pit-run material falling within a vertical pipe in which are fixed buffers or splitters of some sort. The upward movement of air catches the fines and carries them into a pipe, sometimes horizontal and sometimes inclined, on whose under side is a false bottom or trap to catch the plus-100 material. By varying air velocity and the size and shape of the traps, it is possible to put back into the sand nearly all the sand of this desirable grade.

Operation at Division 3

Recovering material of the plus-100 size is a considerable advantage; it makes permissible the use of more effective methods in the air blast through the bank-run material. Because of the relatively low percentage of the sand in the 48- to 100-mesh classification it was important not to lose any appreciable quantity of it. As now operating, an average for the Division 3 separation plant shows a return of about 3 per cent of the plus-100 material from operation of the false bottoms in the horizontal pipes. This small percentage may make the difference between satisfactory and unsatisfactory operation in some of the plants where the margin is rather narrow. Up to 9 per cent of the accepted sand may be fine enough, according to the specifications, to pass a 100-mesh screen. The really troublesome material is that which should pass a 200-mesh screen. As the percentage of fines rises, additional water and cement are required to get effective mixing and attain the 2,500-lb. concrete which specifications require.

At the aggregate plant near Division 3 headquarters, the general plans outlined in the foregoing have been applied. In addition, experiments are being made to control the dust which ordinarily arises in clouds from plants where the fines are discharged from the blower without a treatment. To accomplish this, the 22-in. dust-discharge pipe is terminated in the upper part of a box 4 ft. square and 12 ft. high. Here a downward water spray combines with a large percentage of the dust, which falls to the ground as mud. It was found important to adjust the water spray so that no muffling effect in the discharge pipe would result. A spray too close to the end of the pipe would cause back pressure and cut down efficiency of the blower operation or even cause deposition within the discharge line.

The discharge of the heavier material that falls to the bottom of the inverted

truncated cone, or collector, is picked up by a housed bucket conveyor and deposited in a tight elevated hopper. From this hopper it is dropped into motor trucks and hauled away.

Iron Mountain installation

Although some plants on the aqueduct can blow fines from 150 tons of aggregate per hour, a more typical installation is a plant with a capacity of about 110 to 120 tons per hour. Such a plant, as illustrated in the accompanying sketch (Fig. 3), was installed at East Iron Mountain tunnel.

The air-cleaning process here is applied to all sizes of aggregate to remove accumulated dust wherever it may be. The sand volume ordinarily is about 30 tons per hour, and the quantity of fines removed therefrom varies from 5 to 8 tons per hour. Initial air treatment is given between the horizontal belt conveyor under the stockpile and the inclined belt conveyor, which lifts the aggregate to the batching plant.

This treatment utilizes a heavily built unit 16x30 in. in cross-section and about 6 ft. high. Four adjustable baffles that interrupt the free fall of the aggregate are designed to dislodge adhering dust and sand at the same time that the material is spread out in the unit. At each of these four baffle plates air under pressure is introduced; the incoming air blast is placed directly opposite an air suction of sufficient force to draw off the fines after they have been loosened and blown from the heavier material by the air blast.

The dust-laden air in the suction line is conveyed up through a classifier which is adjustable so that sand of the desired coarser grade (48- to 100-mesh) may be recovered from the under side and returned through a continuous dust-discharge valve to the inclined belt conveyor. The fines, on the other hand, continue on through the classifier into the separation unit in which about 95 per cent of the dust falls to the bottom of the chamber and is removed by an air conveyor. The relatively clean air from the dust collector passes on to the twin fans, which have a combined capacity of 20,000 cu.ft. of air per minute. The discharge line from the twin fans is continued about 300 ft. from the plant, to minimize nuisance from the fine dust that it discharges into the air.

The fan, which delivers air under pressure (No. 1 in the accompanying sketch), is driven by a 10-hp. motor, has a capacity of about 5,000 cu.ft. per minute. The static pressure is between 4 and 5 oz.

All the air ducts are fitted with butterfly valves and quadrants, so that the entire equipment may be adjusted and balanced to provide the regulation required for various degrees of fineness, percentage of fines and, to some small degree, for the variation of moisture content. The plan has been to subject the falling material to blast and suction of sufficient strength to remove as much of the fines as possible. The use of four baffles as compared to a single baffle very greatly improved the separation at the point of initial treatment.

The fines that accumulate in the bottom of the dust collector are delivered by a rotary seal valve into a high-pressure air system actuated by a positive blower. This material is blown to a tailings pile that is about 300 ft. from the plant.

The Colorado River Aqueduct is under construction by the Metropolitan Water District of Southern California. Frank E. Weymouth is chief engineer and general manager.

Taking Account of Thrust in Suspended Bunker Design

Usual method of determining shape of bunker curves based on vertical loads only is inaccurate and often produces distortions and excessive stresses in the plates

By W. A. White and I. R. Smith
Ford, Bacon & Davis, Inc., New York, N. Y.

A RECENT investigation of the design of a suspended coal bunker in a boiler house developed the fact that care must be exercised by the structural designer in the use of published equations for the shape of this type of structure. Very little has been written in textbooks on the subject, but reference may be made to an article by A. S. Berquist in the July 27, 1899, issue of *Engineering News* entitled "A Novel Design for a Steel Bin for the Storage of Coal, Grain, Sand or Cement," an article by Robins Fleming in the Aug. 31, 1922, issue of *Engineering News-Record* entitled "Some Data on the Design of Steel Coal Bins," and to Ketchum's "Walls, Bins and Grain Elevators."

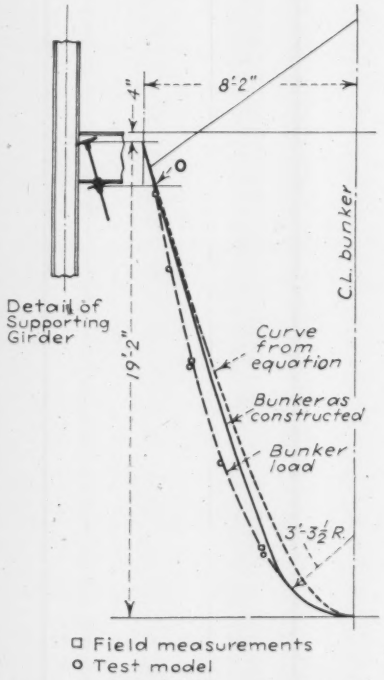


FIG. 1 — BUNKER CROSS-SECTION showing how actual shape departs from theoretical. The test model values were obtained from a heavy paper model.

Each of these authors obtains the cross-sectional shape of the suspended bunker by assuming that the outline is the curve of equilibrium for a chord suspended from two fixed points, carrying a vertical load which varies from zero at the support to a maximum at the center. The equation of this curve of the bunker is given as:

$$Y = \frac{S}{2L^3}\left(3X^3 - \frac{X^5}{L}\right).$$

In this equation, X and Y are the values of coordinates of the line of the bunker with the origin at its lowest point, S is the depth or sag in feet, and L is one-half the span in feet.

No account is taken of the horizontal thrust exerted by the load material on the side of the bunker. In fact, Mr. Berquist states in his article that these forces "will be found to be insignificant in comparison with the sum of the vertical forces." Observation of several bunkers together with a theoretical analysis brings out the fact that the horizontal forces are of considerable importance, particularly in bins which are deep in comparison to width, and that they are sometimes large enough to produce a visible distortion and possibly to overstress the side plates.

Study of bunker cross-section

A detailed investigation has been made of an existing steel suspended coal bunker, the outline of which closely followed the curve of the equation above mentioned and which changes its shape to an appreciable extent when loaded.

Fig. 1 shows the theoretical line for the cross-section of this bunker as obtained from the equation. It also shows the outline of the bunker as it was actually constructed and the outline that it assumed when fully loaded with coal. It will be noted that when loaded there was a movement outward at the sides. The actual maximum amount was found by measurement to be more than 7 in. near the mid-height on each side. This bulge was nearly constant throughout the center three-quarters of the length of the bunker, gradually becoming smaller toward the ends where the side plates are held to their original curve by the end plates.

The bunker is supported at the sides by longitudinal girders, which in turn are framed to cross-beams spanning between building columns. These longitudinal girders also showed the effect of the outward thrust on the bunker sides, the bottom flanges of all except the short end girders being deflected laterally between the cross-beam supports. The maximum amount of this deflection was ¾ in. The bottom of the bunker rose an undetermined amount as the sides moved out.

The stresses in the side plates of a bunker of this type when the sides are permitted to take their natural position according to the load on them are, of course, nominal. When, however, the assuming of this natural position is prevented, as at the ends of a bunker, additional stresses are set up which it is difficult if not impossible to estimate. This applies not only to the side plates themselves but to the connections between the side plates and the end plates. In the particular bunker investigated it also resulted in an additional computed stress of 18,000 lb. per sq.in. in the bottom-flange angles of the longitudinal supporting girders, due to lateral loads. Measures were taken to correct the girder deflections, and an excess of material at other points in the structure prevented excessive stresses. Although in this case provision had been made to take care of the raising of the bottom of the bunker, it is known that in at least one other case the raising of the bottom seriously affected the adjustment of equipment connected to it. In view of the above it seems desirable that the original outline of bunkers of this type should more nearly approximate the shape which they will naturally assume when loaded with the material that they are designed to hold.

Magnitude of horizontal forces

The effect of the horizontal forces was studied in the case of the bunker under investigation. The weight of coal was assumed at 55 lb. per cu.ft., the angle of repose at 35 deg., and the angle of friction of the material on the side of the bunker at 18 deg. The vertical loads consisting of the weight of the bunker and the weight of the coal between the line of surcharge and the curve from the equation were computed for each foot of bunker width. The horizontal forces were computed by assuming a negative surcharge on a longitudinal section at the center of the bunker.

These horizontal forces were combined with the vertical forces and were applied at the side of the bunker at intervals corresponding to the vertical forces. The equilibrium polygon for these forces passing through the point of support and the bottom of the bunker was then constructed, using a force polygon as shown in Fig. 2. The resulting curve was found to coincide very closely with the actual line taken by the bunker when loaded. New vertical and horizontal forces were then computed on the basis of the new curve, and a second equilibrium polygon was constructed. This followed the first so closely that the second operation is considered unnecessary in other investigations.

In order to study further the distortions in the bunker when loaded to various depths, a model of the existing bunker was constructed to the scale of ¼ in. to 1 ft. The sides were made of heavy paper rigidly supported by top girders and restricted to the originally designed cross-section at the ends. Measurements were taken at different depths of loading up to full capacity, and the results were found to coincide closely with measurements of the actual bunker under similar conditions of loading. Points measured on the model at full loading are plotted in Figs. 1 and 2. It will be seen that they fall somewhat outside the line of the actual bunker, probably due to the fact that the steel plates in the bunker have some stiffness, whereas the sides of the model had none. An interesting point noted in connection with the tests was that practically all of the movement took place before the loading had reached half capacity.

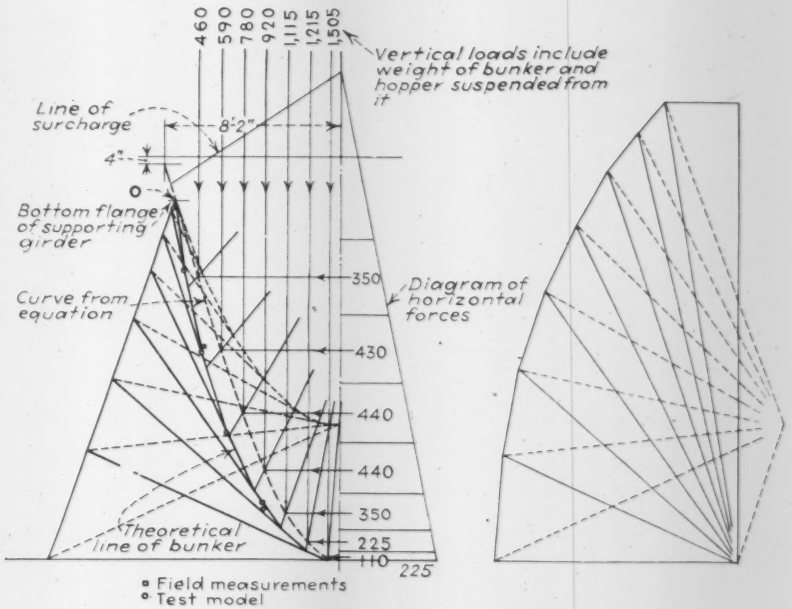


FIG. 2—FORCE AND EQUILIBRIUM POLYGONS of the coal bunker of Fig. 1, based upon a combination of vertical loads and horizontal thrusts. The resulting curve closely follows the curve of the loaded bunker.

Suggested layout procedure

The following procedure is suggested for laying out a suspended bunker in order that the distortion under load will be reduced to a minimum. First, lay out a tentative curve either by means of the equation or graphically by means of the equilibrium polygon, following the procedure outlined in the references mentioned heretofore. Next divide the bin into vertical strips of convenient width and compute the vertical load of each segment of material. Compute the horizontal force at the point of application of each of the vertical loads. Finally, combine these vertical and horizontal loads and construct a new equilibrium polygon. The above procedure for the bin investigated is illustrated in Fig. 2.

The line of bunker obtained will probably lie somewhat outside the most desirable line for the actual construction because, in the above method, no account is taken of the stiffness of the bunker sides. Attention is also directed to the fact that by straightening out the sides of the bunker to a small degree, less-than-capacity loadings will be taken care of in better fashion.

Timber Bridges Fit Needs of Coast Highway Route

Scarcity of materials for concrete aggregate and long haul lead to extensive use of timber on California coast road

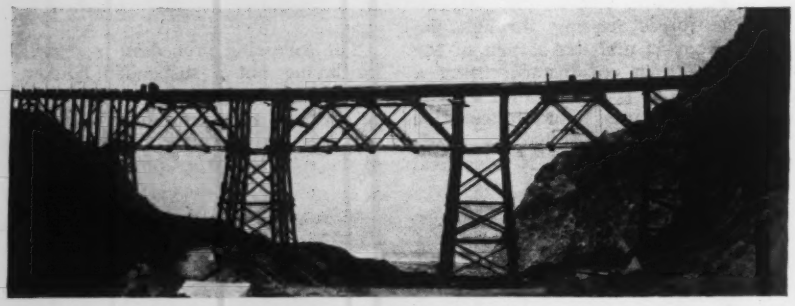


FIG. 1—TYPICAL TIMBER HIGHWAY STRUCTURE on the new California coast route. View shows Willow Creek bridge looking toward the ocean.

CONDITIONS governing the design of bridges on the coast section of the California highway system so favored timber as a construction material that it has been used for eighteen structures in a length of fifty miles. With the thought that this experience might be useful in other states where conditions necessitate low-cost bridges, an endeavor has been made to present in this article the reasoning employed in making selection of material best suited to conditions. Details of design and construction on one of the structures, a 180-ft. timber arch, were published in *Engineering News-Record*, Jan. 1, 1935, p. 147. —EDITOR.

IN 1916 an act of the California Legislature authorized construction of a highway, known as the coast route, to follow the shore line of the Pacific Ocean as closely as practicable from the northern boundary of the state to the Mexican border. Much of this route has been completed, but there is a 70-mile stretch in Monterey County on which construction is still under way. Reasons for making this one of the last portions of the route to be undertaken are: (1) the difficult construction in rugged precipitous country, which made it expensive; and (2) the lack of tributary traffic, which lessened its local importance. Military advantage and the scenic attraction of a through coast route have been the principal arguments for construction of this portion of the route south of Monterey.

Although heavy grading accounts for the largest part of construction cost, the many gorges and canyons made the question of bridge construction an item of major importance. Some of the crossings involve relatively wide canyons with the highway grade 15 to 60 ft. above natural ground level. Most of the bridge sites are within 500 ft. of the ocean; the drainage areas are small, and floods are not large enough to affect span lengths. For the most part formations on which to place foundations were found at reasonable depths.

While the foregoing elements do not make a complex problem in deciding upon design, there are two additional factors of particular importance in selecting the type of structure: (1) On this route there is likelihood of relocation because of land slips or decision to modify grade, width or curvature standards—modifications which already have been made elsewhere on the coast route; and (2) an extremely long haul is necessary on materials that have to be trucked from the railroad.

Although the alignment selected in the location survey is believed to be the best, all things considered, the route traverses a region of very steep slopes along the ocean shore where land slides are frequent and extensive. Extensive sliding during the life of a bridge structure would be likely to necessitate relocation of the highway (and the bridge as well) on a somewhat different alignment.

The long haul is a consideration on two counts—namely, on the entire 140-mile stretch from Monterey to San Luis Obispo, which are the points where this route intersects the railroad, there is practically no source of supplies and very few, if any, deposits of material suitable and readily available for concrete aggregates. Secondly, the road over which materials have to be trucked is extremely tortuous and has many steep grades. The city of Monterey, the northern terminus, is 125 miles south of San Francisco; the southern terminus is San Luis Obispo, a town near the coast on the Southern Pacific Railroad, likewise is a long distance from any city of large size.

Taking these factors into consideration in selecting the type of structure, concrete was ruled out (except in crossings where alignment could not be improved) despite low maintenance, because of the relatively high first cost and the fact that there would be no salvage in the event of alignment change. Steel structures would have high salvage value, but to the high first cost, on account of the long haul and the difficulty of moving in large members, there was to be considered the close proximity of the ocean with consequent requirement of frequent paintings if there were to be effective resistance to corrosion from salt fogs. Only one steel bridge is being built on the route; this is a viaduct 425 ft. long with a main deck truss span of 142 ft. It is at a location 44 miles south of Monterey.

Timber was considered to be the material most effectively meeting the requirements for most of the structures. Although the timber has to be trucked the same distance as would other construction material, its relatively lighter weight meant that more square feet of bridge-floor area could be hauled per truck load. In the event of realignment a timber bridge is, of all bridge types, the one that can be moved most readily; it is not subject to corrosion from salt fog; and the division of highways, when using high-grade redwood timber on concrete supports, believes that it is reasonable to expect a 30- to 40-year life of the structure. This life estimate is based on untreated select, all-heart redwood timber. It is not customary to treat redwood because of the long life and moisture-resistant qualities that it has in its natural state. The fire risk to bridges on the coast route is considered relatively low because of climatic conditions and the absence of dry brush, as a rule, at the bridge sites. There is a termite risk, of course.

Where the heights of roadway were not great, the type of construction selected was timber trestle with laminated timber decks. Where the grade line was higher, timber deck trusses on timber towers flanked with timber trestle were found to be most expedient. These trusses were generally 57 or 76 ft. long. The custom is to build in spans which are multiples of 19 ft., to permit use of 20-ft. timber lengths in the floor system. In two bridges 126-ft. trusses were used, and there was one location (Dolan Creek) where a 180-ft., three-hinged timber arch was built.

During the last two years thirteen redwood bridges have been built with federal aid on a 30-mile section of this route below Big Sur, which is at the southerly end of the oiled road extending 30 miles south of Monterey. Material for seven of these was hauled in from Monterey, and that for the other six was hauled north from the wharf at San Simeon, to which it was delivered by boat. The timber shipped to Monterey also came by boat except during the period of the longshoremen's strike. These thirteen bridges involved some 3,000,000 ft. of structural redwood.

Engineering Applied to Low-Cost Homes

Two Examples of Modern Residence Building

FIG. 1—ATTRACTIVE DEVELOPMENT of low-cost concrete-frame houses at Rochester, N. Y.

Mass Production of Concrete-Frame Houses

A GROUP of 43 attractive, low-cost, single-family houses of unusual design is under construction by mass-production methods in a private housing development on the outskirts of Rochester, N. Y. The basic design of the units is standard and identical as to shape and size—a reinforced-concrete frame with concrete floor slabs—comprising six rooms on two floors and an attached two-car garage. Stucco is standard exterior finish, though the owner is permitted to specify other finish if desired, at extra cost. A number of units have been finished all or in part with brick, stone, shingles or wood siding, which has greatly improved the mass appearance of the development. No changes are permitted that would require alteration of the basic frame or room layout, except that the floor plan is reversible to place the living room on either the right or left side at the option of the owner. At extra expense the owner may specify certain changes and additions, such as bay windows, overhanging second-story fronts, extra room on top of the garage, or conversion of all or part of the garage into a room.

General development

As can be seen from Fig. 1, the development is laid out in two concentric U-shaped rows, with 18-ft. bituminous macadam streets between the rows. Two cross-streets are provided. The houses are set far back from the street, on lots of 80-ft. front and 120-ft. depth (minimum size); lots on the curved corners are larger. Crushed-stone walks and driveways are standard. Sanitary and storm sewers, water, gas and light services were all installed prior to start of construction.

The development is just outside the eastern city limits of Rochester, in the town of Brighton. It is close to new modern schools and a suburban shopping center, and to streetcar and interurban lines leading to the city. All houses were sold before construction started on any of them.

ENGINEERING is being applied to house building, both in design and in construction. These two articles indicate what can be accomplished in low-cost residence construction when engineering principles are used. The result is a house of excellent quality, built to high structural standards and within a reasonable cost range, all of which are necessary if the revival of residence construction is to materialize to its full possibilities.

The two types of construction portrayed here are an interesting departure from the usual design, yet the two differ widely. At Rochester a group of attractive, well-built homes of concrete frames and floors is being produced at low cost through standardization in design and by repetitive construction methods. At New Orleans a monolithic concrete house has been built by the International Cement Co. to show the possibilities and the cost of homes of this type. Special attention to form design resulted in low cost for this house. These two types indicate a possible trend in modern residential construction.

Low-cost construction

The houses are low in cost—$5,900 is the complete cost of a standard house, including land, grading, seeding, walks and streets and all utility installations—but are not of the familiar cheap construction. They are unusually well built and are equipped with all modern conveniences. The low cost is made possible by standardization of design, equipment and fittings, and by repetitive construction methods.

To save excavation expense and to permit digging with a power shovel, the basement is built barge-shaped, with sloping ends and vertical sides. The

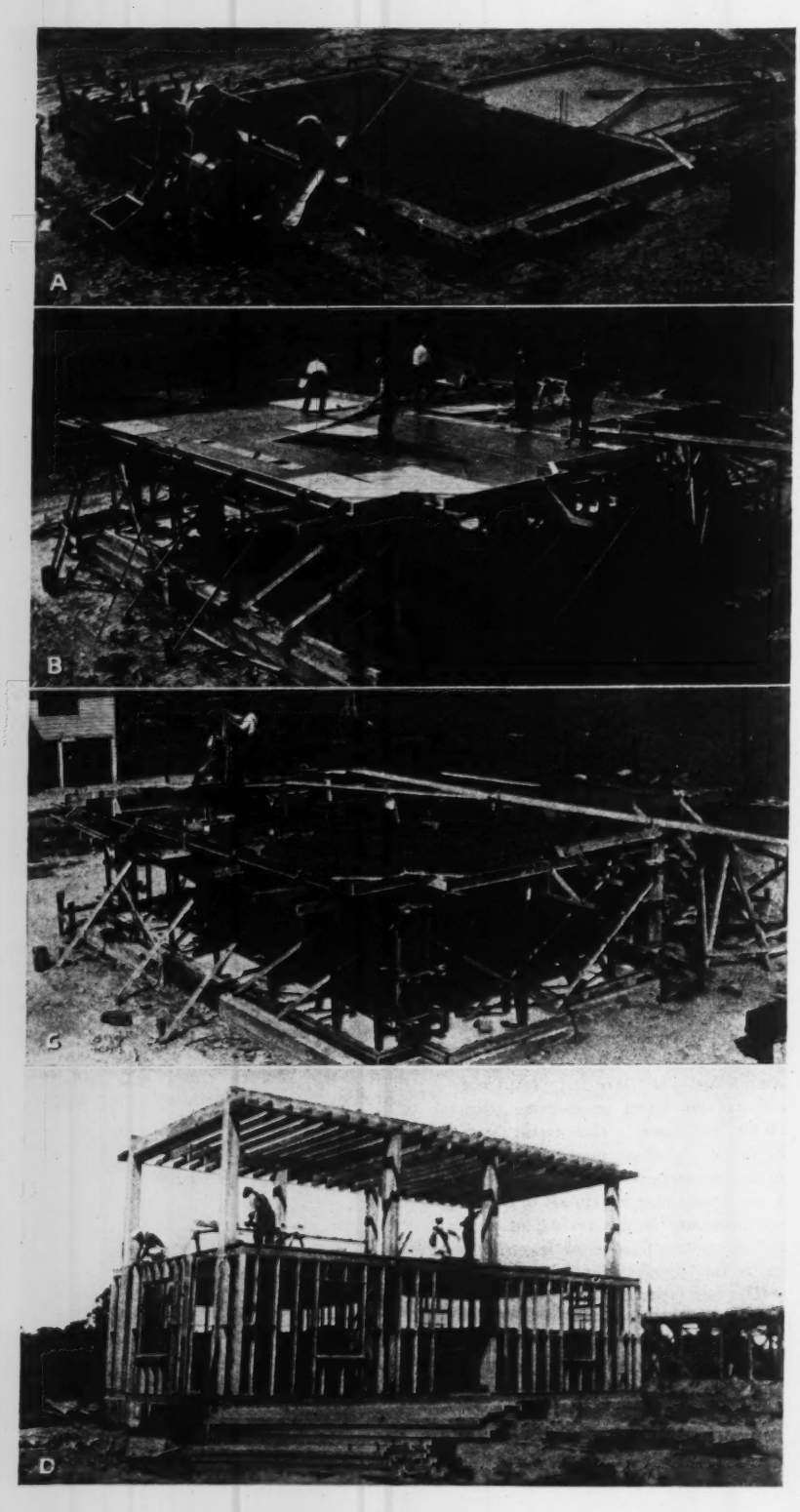


FIG. 2—EARLY STEPS in construction of the concrete-frame house: A—Excavation of the barge-bottom basement, dug with a power shovel, complete; poured concrete cellar walls and garage floor in place. B—Forms are ready for lower columns and second floor; wallboard for first-floor ceiling is placed over steel-floor forms prior to pouring of floor slab. C—Pouring concrete on the second floor and the lower columns with wheelbarrows; usually crane and bucket placement is the method used. D—Concrete frame is complete, the second-floor ceiling joists are hanging from the top concrete girders, and building of the exterior walls is under way.

center third section of the basement, 6 ft. deep, has a horizontal floor; the floors of the two end thirds slope to the surface. Walls and floors of the basement, including the slopes, are of poured concrete.

The concrete framework consists of eight 10x10-in. reinforced-concrete columns, resting on spread footings and extending to the second-story ceiling level, with a grid of concrete girders at the second-floor level and at the tops of columns. Along the front the columns are set back 2½ ft. from the wall, the floors being cantilevered for this distance.

The lower floor is a 6-in. concrete slab supported by the cellar walls; the second floor is also of concrete, carried on the girders. Joists for the second-story ceiling are hung from the top system of girders. The rafters rest on top of these girders. Fig. 4 shows the arrangement of the rooms and the location of the columns. At the back of the garage are two columns which frame into concrete beams supporting the concrete roof of the garage, which also serves as an overhead porch deck. A poured Haydite concrete chimney serves a fireplace and the furnace.

Finish and equipment

A major economy through mass production was achieved in the finish and equipment of the houses. This is not ordinary residence construction, and the designs were made to achieve certain desired results in economy, yet to provide better than average service. Consequently, where standard products served the purpose, they were purchased in quantity. Typical of these items are French steel windows, monel metal sinks, doors (all one size), gas water heaters, electric refrigerators, laundry trays, lighting fixtures and metal kitchen cupboards.

However, to meet certain needs or because of desired economy, some products of special design are used, the quantity buying resulting in sufficient savings to make their use possible. The oil-burning hot-air furnace is an example. These units, designed especially for this development, are small, compact and fitted with blowers and humidifiers, representing the latest principles in house heating. Circular floor grills for the heating system are another example of special design. Wrought-iron stair railings, steel door and window trim and steel baseboards are made to order. The baseboards contain a removable center strip, which snaps on and off. Sections of this center strip are fitted up on the job with electrical outlet plugs spaced 18 in. apart. The plug sections are snapped into place on the baseboard at intervals around the room, providing an abundance of wall outlet plugs.

Another feature of this same kind is the insulation of the exterior walls. Rather than use prepared insulation, the

contractor buys the material in bulk by the carload and packs it into prepared waterproof paper bags that fit snugly between the wall studs. The same insulation is placed over the second-story ceiling.

Exterior walls and interior partitions are non-load-bearing, and are usually framed of 2x4-in. studding. The exterior finish is stucco over plaster board or metal lath, except where the owner specifies a more expensive finish. Interior walls and ceilings are either plastered over rock lath or metal lath, or are papered over wall boards. Floor finish is maple or oak laid in mastic or linoleum on a felt base.

Construction

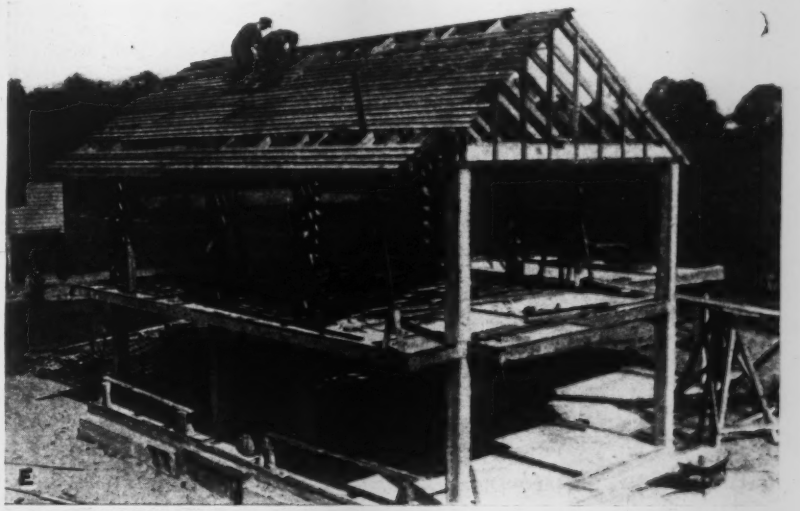
An ideal construction program for a development of this type would be one based on a straight-line operation, with certain crews performing definite work on each house, following each other in logical order from unit to unit. Actually, on the job the construction procedure is kept as close to this ideal as possible but falls short in several respects. Delays in material deliveries, bad weather and other troubles throw the ideal construction schedule off balance at times. As a result, construction usually proceeds on a small group of houses at a time rather than on the whole development. Figs. 2 and 3 show the construction steps.

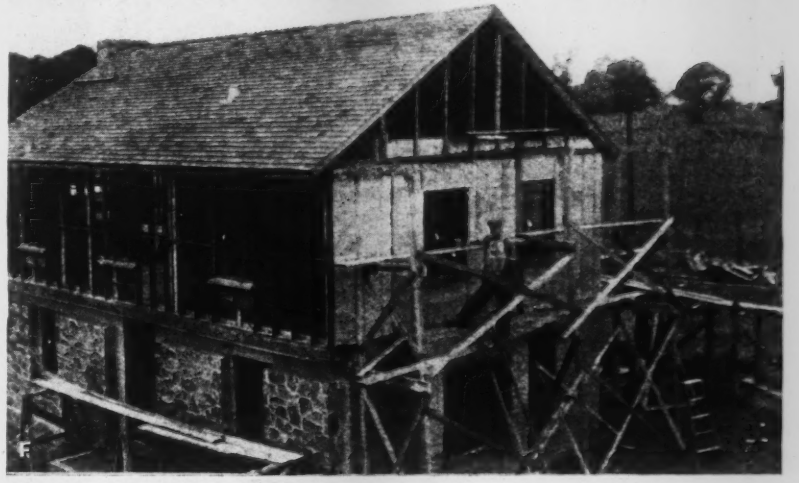
Cellar excavation and heavy grading are done with a power shovel, while lighter grading and finishing are by a bulldozer. All of the excavated material is used for filling and grading. Because of the sloping ends, basement excavation is largely by power shovel, and very little hand trimming is necessary.

Concrete placement is split up into several pours: (1) basement walls; (2) garage floor; (3) first-floor slab; (4) second-floor slab, beams, garage roof and supporting columns; (5) second-story columns and top beams. Pours 1, 2 and 5 are usually made with a small mixer and wheelbarrow placement; the remaining pours are with a paver mixer and crane and bucket placement.

Naturally, concrete forms are of reusable panels wherever possible. They are of wood for the cellar walls, columns and beams, and of steel for the floor slabs. Where wallboard is to be used as the finish of the first-story ceiling, wallboard sheets are laid directly on the steel slab forms prior to pouring the slab concrete. When the forms are stripped, the wallboard adheres to the under side of the slab.

After the concrete floors and frame are complete, construction proceeds along the same lines as in ordinary house-building. Work is speeded up to some extent by a central carpenter yard, where all door frames and other wooden items are fabricated, and much of the lumber is cut to length. Carpentry, plumbing, heating, decorating, lighting





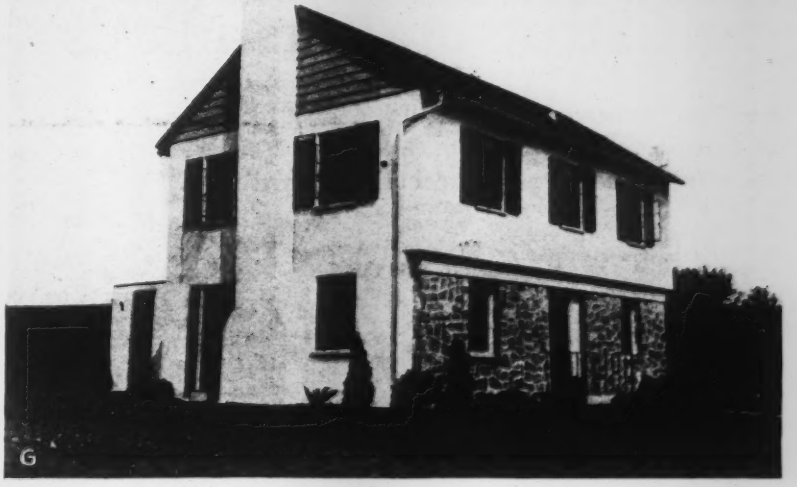


FIG. 3—FINAL STEPS in construction of the concrete-frame house: E—Framing the roof, to be covered with wood or asphalt shingles. F—Placing the exterior wall insulation and finishing the exterior; the insulating material is received in bulk and packed in bags on the job to fit between studding and second-floor ceiling joists. G—The finished house; the blinds and stucco finish are standard, while the stone finish on the lower-story front, the overhanging second story and the siding on the gable are extra. This particular house won first prize in a recent FHA contest for appearance. Note: These and the preceding views are not all of the same house but represent typical steps in construction.

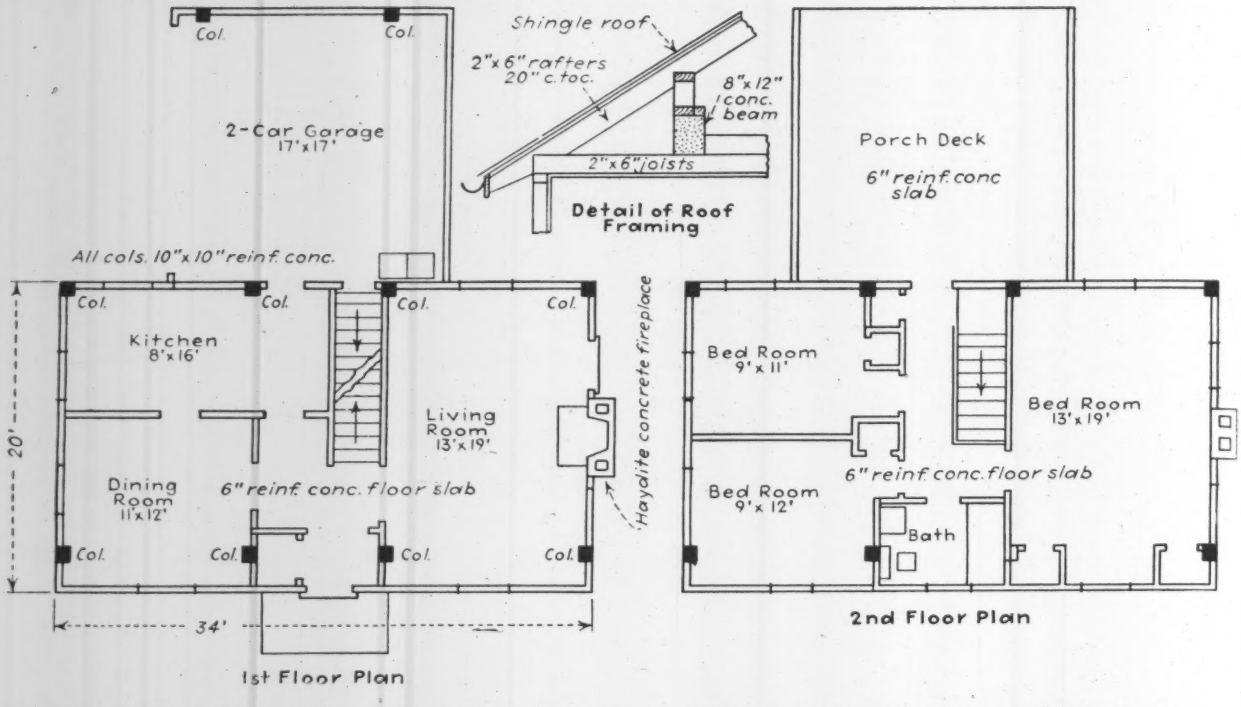


FIG. 4—FLOOR PLAN of the concrete-frame house, showing location of reinforced concrete columns that carry the superstructure.

and installation of miscellaneous items are all done by separate crews that work from house to house.

The project is being developed by Homindustries, Inc., a Rochester corporation. Harold S. Curren, contractor of Rochester, is associated with the promotors and is doing the construction work. C. Storrs Barrows, of Rochester, is architect for the project. The development is financed through the Federal Housing Authority.

Building a House to High Structural Standards

Monolithic construction of walls, floors, roof and partitions of a concrete house in New Orleans introduces a special steel forming system

By D. S. MacBride
Manager, Incor Division, International Cement Corp., New York, N. Y.

AS the construction industries tackle the job of selling housing in competition with the hundred-and-one other necessities and luxuries which will continue to compete for the consumer's free-will purchasing power, the basic problem to be faced and solved is this: Shall the sales appeal of housing be based merely on the use of more and better gadgets, or shall we offer well-designed—"engineered"—homes that are built to the same high structural standards as the better-type non-residential buildings?

In the practical, everyday meaning of the term, engineering implies the attainment of a predetermined result at the lowest practicable expenditure of money. That was the purpose underlying the construction of a house in New Orleans by the International Cement Corp. subsidiary, the Lone Star Cement Corp.

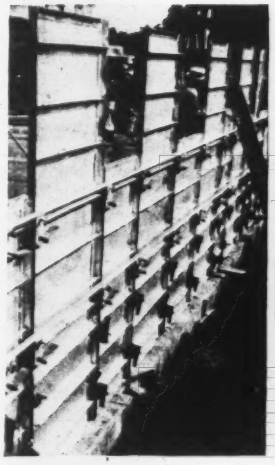
The project was directed toward the great middle range of homes costing from $5,000 to $10,000, where individuality and architectural distinction are vitally important but where all-concrete construction was seldom used because costs were too high. Obviously, that was not because concrete itself was expensive; experience in every other type of construction proves the reverse to be true. Rather, it was and is due to the methods of construction usually employed; at least, that was the hypothesis which the International Cement Corp. set out to prove or disprove.

A one-piece concrete house

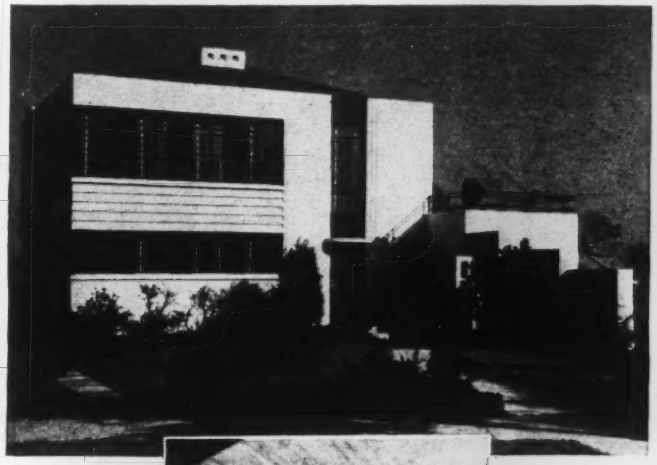
In the selection of construction, type consideration was given to concrete masonry, precast concrete and monolithic concrete. Monolithic concrete was chosen in the belief that it made possible the desired combination of architectural beauty, durability and economy to an unusual degree. Incidentally, the term "concrete house" is often used loosely. Strictly speaking, a house having concrete masonry walls, wood-framed floors, partitions and roof cannot be termed a concrete house. Only when all of the principal load-carrying elements, both the walls and floors, are made of concrete do we have a concrete house.

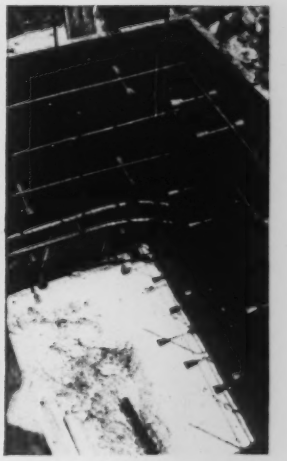
After a study of monolithic systems, the choice narrowed down either to a plain wall of uniform thickness with embedded rigid insulation or ribbed-wall construction. The former had the advantage of simple forming and elimination of interior lath and plaster. The ribbed wall is more economical in material, easily insulated, accommodates all piping and wiring in vertical air spaces and assures freedom from sweating. On these grounds, the ribbed monolithic wall was selected.

AN ALL-CONCRETE HOUSE AND HOW IT WAS BUILT

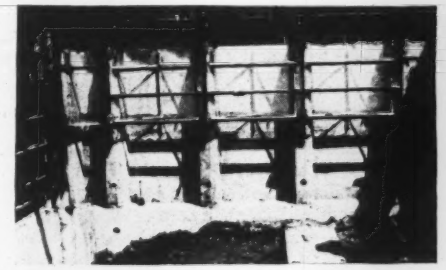


ASSEMBLY of outside forms. U-clamps held over ends of spacer bolts by wedges maintain forms vertical, while horizontal alignment is provided by the waler angles. Staggering of forms also aids in vertical rigidity.

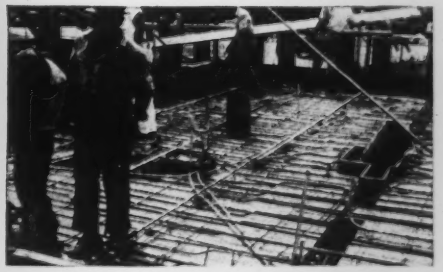




INSIDE the outside form panels, showing reinforcing and spacer bolts, which also serve as supports for the horizontal bars. Slots in the ends of the cones accommodate a tool for removing the spacers.



RIBBED-WALL SECTION after removal of first lift of inside form panels. Outside panels are carried full height, while inside panels are installed as concreting progresses. U-clamps and wedges hold the side panels against the spacer bolts.



FLOORS are formed and poured with the last wall lift, as in any conventional concreting operation. The spiral staircase (left) was a special forming operation. Note variation in spacing of wall ribs to accommodate doors and windows.

A new method of forming was used in which steel forms having flat exterior panels and arched interior panels are so fastened together that a self-aligning wall results. The outer wall forms consist of plain 2x4-ft. panels reinforced with welded angles and held in line by angle-iron walers that are secured in place by wedges and thumbscrew take-ups. The inner and outer forms are spaced by two cones and spreader bolts. Wedges and U-clamps hold the forms together and draw the cones tightly against the inner face of the panels. Reinforcement is placed before the inner forms are set.

Inner forms are pan sections which, when fitted together, form the ribs. U-clamps also hold the sections together and are held in place by wedges driven through the spacer bolts, which are threaded into the cones. These cones and bolts are readily removed after stripping by a special tool. Load-bearing partitions are formed in the same manner as the outer walls, except that only straight panels are used. Pipes and conduits are placed before concreting the floor slabs.

These flexible steel forms are adaptable to any style of architecture. Simplicity in erecting, adjusting and stripping reduces the cost of forming and removes a principal obstacle to all-concrete residence construction. Forming costs on the Lone Star home, for example, were from 40 to 50 per cent of the estimated cost of using wood forms.

Design and concreting

A low-bearing-value soil, (500 lb. per sq.ft.) at the site of the Lone Star home made large footings necessary. Excavation was carried down 3 ft. to soil of constant moisture content, and 3 in. of clean white sand was spread over the bottom of the excavation. The footing itself is a 10-in. reinforced-concrete slab with a contact area 15 per cent greater than the area of the first floor. Foundation walls were designed as beams 8 in. thick and 4 ft. high, and were reinforced with two 1-in. bars top and bottom. The footing cost was 20 per cent of that of the bare structure, probably five times the cost of footings for the average house built elsewhere.

By varying the spacing of the ribs in the walls and by using plain form panels on the inside, 8-in. wall sections were made, to accommodate window bucks and door forms. At all openings a full reveal was obtained.

The first-floor slab, 4 in. thick, was placed on untamped loose-earth fill, which in drying out will shrink away from the slab, leaving an air space. The second floor and attic slabs, also 4 in. thick, were formed in wood. A quick-setting cement was used in the second floor, the attic and in cantilevered balcony slabs, to permit 24-hour removal of supporting shores and to enable the contractor to use the freshly-placed concrete without curing obstructions.

The concrete was designed for a strength of 3,000 lb. per sq.in. at 28 days, of maximum density and workability. No waterproofing admixtures were used, reliance being placed upon good design, careful placing and thor-

ough curing. Concrete was purchased from a central mixing plant: in the floor slabs a 5½-bag mix, approximately 1:2½:3¼, using 1½-in. maximum-size aggregate; in the walls a 6-bag, 1:2¼:3 mix, using ½-in. maximum-size aggregate. Concrete was placed in three lifts for each story: the first and second lifts were terminated at the sill and lintel lines, respectively; the third lift included the wall beams and the floor slab above.

An interval of about 24 hours separated each pour. After each pour the concrete was leveled off and a 1-in.-square wood strip was pressed against the outer form into the concrete, forming a groove, the bottom surface of which was square with the face of the wall and level in the direction of the wall. Before the concrete hardened, this strip was removed, permitting the next lift to be placed without feather edges and unsightly irregular joints. Before placing a lift, the concrete was well cleaned and covered with a thick cement grout, to insure a perfect bond.

The problem of adequate insulation is easily handled by the use of ribbed-wall construction. In the Lone Star home, the ribbed walls are 3-in. thick, with ribs 4 in. wide and 5 in. deep, spaced at intervals of 12 and 24 in. with 1 in. of rigid insulation applied across the ribs and used as a plaster base.

So much for the structural features, by which the durability and fire resistance of all-concrete construction were obtained at a cost approximately the same as that of good frame construction, in a house which insurance underwriters estimate has a minimum useful life of 100 years.

Other features are a 12x28-ft. living-dining room opening onto a north terrace, away from the street. The kitchen, convenient to the dining end of the living room, is adjacent to the heater and laundry room. An electric refrigerator, gas range and gas-fired furnace are among the major-equipment items. Upstairs are two bedrooms and a bath. There is a two-car garage.

Roads Fight Snowslides on the Pacific Coast

Specialized organization and equipment keep the high Coast Range passes open for highway transport

WINTERS are much alike in the high altitudes of the Rocky and Coast Range Mountains, and snow control on the highways is an annual fight to keep the passes open. This winter the work has been perhaps more difficult in places but not enough harder to call for change from normal procedure. The accounts that follow represent standard and not extraordinary practice. They are from states that are noted for advanced practices in highway construction and operation, and they are from authoritative sources, as were the reports published last week from the plains states of the northern Mississippi valley.

WASHINGTON

L. V. Murrow, *Director of Highways*

INCLUDED in the state highway system of Washington are roads that traverse three mountain passes in the Cascade range: Stevens, El. 4,061; Snoqualmie, El. 3,004; and Chinook, El. 5,440. Two other passes located on spurs of the main range are Blewett, El. 4,071; and Satus, El. 3,149.

The depth of snow in these mountain passes reaches quite considerable proportions, as for example, at this date, Feb. 25, there is on the roadside in Stevens Pass 104 in. of packed snow, in Snoqualmie Pass 144 in., in Chinook Pass 160 in., in Blewett Pass 69 in., and in Satus Pass 40 in.

The state of Washington's department of highways keeps open for travel throughout the winter season the routes of State Roads No. 2 and No. 8. The former, which is the main traveled east and west arterial route, includes Snoqualmie Pass and Blewett Pass; and the latter, which is the connecting road between the Columbia River and central Washington, includes Satus Pass.

Snow removal in these mountain passes is accomplished by rotary snow plows stationed in the passes, which are at all times ready for action. Snow camps are maintained at the various summits, and experienced crews are available and ready to move at all hours, night or day.

The removal of ordinary snowfall, which is accomplished without particular incident, is sometimes aggravated by the occurrence of slides. These slides, generally of moderate proportion, seldom cause interruption to vehicular traffic for more than a very few hours.

At 2:30 a.m. on the morning of Feb. 22 there occurred a series of slides of unusual magnitude, which were attended by the loss of three lives. These slides extended over a section of road about a mile in length and were caused by saturation of snow due to melting that had occurred. The greatest of these slides was some 1,700 ft. in length and piled up over the highway to a depth of about 25 ft. Several trucks and a few passenger cars were engulfed by snowslides, but none was actually caught while in movement; all were halted at slides that had occurred and caught by other slides that came later. Removal of slides by state snow-fighting equipment was immediately undertaken, but the road was not opened to vehicular traffic for about 36 hours.

Engaged in the opening up of the highway for travel were four rotary snow plows and a number of push plows of V-type with wing attachments. Two of the rotary plows were brought in from other passes, one from Blewett and one from Chinook, and it was possible to get these moving almost instantly when the necessity became apparent, through calls by radio. All rotary plows are equipped with short-wave radio transmitting and receiving sets, these being units in the system of radio communication that is employed by the department of highways.

The system of radio communication consists of eighteen fixed stations and fifteen mobile stations, these latter principally on snow plows, others on official cars. At no time during these recent troubles was there a single moment when exact information was lacking as to what was occurring in the way of new slides, and as to the progress of the removal work. It was also possible to secure instant movement of auxiliary equipment as necessary and arrange for bringing in relief crews. It is estimated that through the convenience of radio the pass was opened up in less than half the time that would have been taken otherwise.

Radio also was decidedly helpful in relieving the anxiety of friends and relatives of those who were marooned on the pass, among whom were many skiers who had gone to the summit for winter sports, in advance of the slides.

In other passes mentioned in this article the snow is kept plowed out to well within range of each summit. This is done to facilitate early opening of the passes after the snow season is passed. Similar equipment is used in these other passes as at Snoqualmie.

Another major snow-removal operation that is carried on throughout each winter is at Mt. Baker in Whatcom County. On a 23-mile section between Glacier and Mt. Baker Lodge, snow that had reached a depth of 160 in. on this date (Feb. 25) is kept removed from the highway for the accommodation of winter sports that are carried on very extensively in the Mt. Baker area.

Transcontinental railroads entering the Puget Sound area via Cascade Mountain passes all experienced some difficulties, but not to the same extent

as the highways, this latter due to the fact that tunnels protected them in the higher reaches and wherever there were greater depths of snow susceptible to sliding.

CALIFORNIA

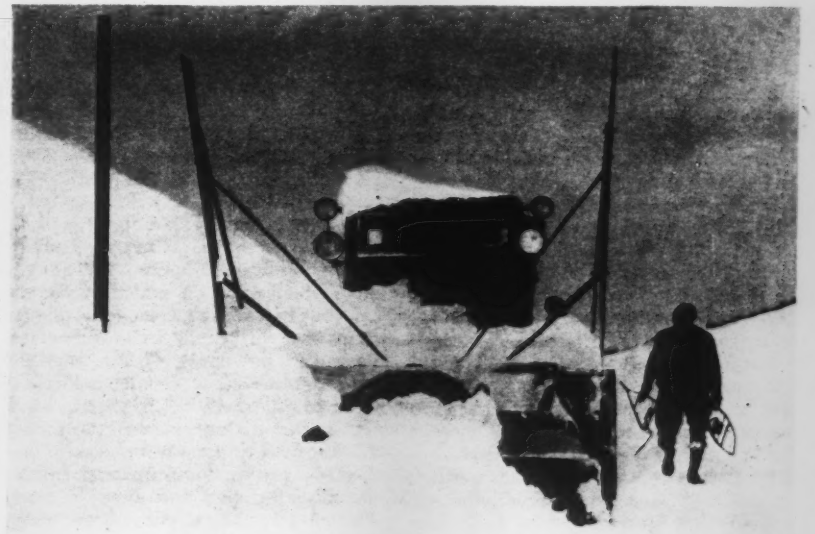
Editorial Interview

THIS is a season of heavy snowfall in mountain districts of the California highway system. At the summit of the Sierras the snow remaining on the ground last week exceeded 16 ft. in depth, and altogether snow-removal work was or recently had been under way on about 4,000 miles of state highway out of a total of 14,000 miles on the entire system. However, because every winter presents severe snow conditions on California mountain roads, equipment and trained organization are kept available in high-altitude snow areas, and this season's requirements are being met without additions to the regular maintenance crews. About 200 men and some 150 snow plows of all types now are employed on snow-removal work. Even in high mountain passes, interference with through traffic has been limited to relatively short periods during the height of bad storms. Last year a total of $350,000 was spent on snow removal from state highways, and this year it is estimated that about the same sum will be required.

Importance of routes in the matter of amount of traffic, the quantity of snow and the type of construction have been considered in determining what routes to keep open. Obviously, surface, alignment and grade are factors. However, on all important routes these three factors are favorable. Eleven high mountain passes are kept open to traffic all winter, while seven passes annually are closed during periods of heaviest snowfall. The mountain passes not kept open range up to El. 10,000, and in these much ice accumulates, making the spring opening a job that is hard on equipment and on road surfaces because of ice in the packed snow.

The roads kept open include one (Deadman's Summit) which has about 40 miles of road above El. 8,000. The heaviest snow on all-winter routes, however, comes in Donner Pass (El. 7,100) on the transcontinental route across the Sierra directly east of San Francisco. On this route the method of operation is typical of the general plan on all mountain passes. Crews, equipment and repair depots are established and maintained at vantage points along those portions of the route where heaviest snow-removal operations are expected. Near Donner Summit, for example, are two permanent camps, each for 40 or more men. These are manned with crews fully trained in the plan of operation. As soon as snowfall begins, the crews go to work in three eight-hour shifts and continue so long as snow remains on the highway.

A BOOM-LIKE ARM with rotating cutters on rotary snow plows in Washington breaks down high banks and prevents the plow from tunneling and becoming inoperative.



ROTARY SNOW PLOWS in California, showing steel guides for trimming slopes. At the left is a guide stake to aid the driver. The ends of the two augers, set one above the other, feed snow through a central opening to the blower.

Equipment includes several types of plows, all operated by trucks, as tractors do not have the speed required for at least part of the work. Trucks have been found satisfactory even where rotary plows are advanced slowly through heavy drifts. Ordinarily a start is made with a scraper shoving freshly fallen snow into windrows. This is followed by the auger-blower type of plow also used in attacking drifts and slides. With a double auger feeding to a rotary or blower, this type moves easily through 4-ft. drifts, which sometimes accummulate between trips of the equipment. This type of plow has a pair of inclined metal guides to shave the slopes of the snow-cut made by the plow. It moves through drifts up to 3 or 4 ft. deep at 10 to 12 miles per hour, throwing snow as much as 75 ft. to either side. No snow sheds are used, and the total length of fences to prevent drifting is only about 15 miles.

National Beach Reserves

According to the annual report of the Secretary of the Interior, recently published, plans have been made to establish a system of seashore beach reserves for public use: "Need for conserving for the public the finer beaches along the coasts and the Great Lakes was emphasized by studies of the National Resources Board. Sixteen seashore recreation areas were studied, and it is recommended that early action be taken to establish a system of national beaches before all have passed into private hands or been too much subdivided."

A.C.I. Convention Adopts New Building Code

Sessions in Chicago bring building regulations into line with new knowledge and record progress in concrete research, manufacture and application

MEETING in Chicago Feb. 25 to 27 for its 32d annual convention, the American Concrete Institute chalked up its best attendance record in five years, with some 700 present. The various sessions of the meeting reviewed concrete progress during the past year in stimulating manner. Outstanding among the developments was the adoption of a new set of building regulations, to replace those in force since 1928. Second was the recognition given to the importance of concrete durability. Construction, design and research were also represented by papers of merit.

F. R. McMillan, director of research, Portland Cement Association, was elected president, succeeding P. H. Bates, of the Bureau of Standards, who has served two terms. J. C. Pearson, Lehigh Portland Cement Co., and John J. Earley, Washington, D. C., were elected vice-presidents. Next year's meeting will be held in New York.

In his address as retiring president Mr. Bates called attention to the fact that the membership of the American Concrete Institute is not as varied as the interests of the Institute warrant, and urged that these interests be given latitude for better expression by the formation of divisions that would concern themselves with specific subjects in the field of concrete. Simultaneous sessions and more papers at each convention were also recommended. Mr. Bates further urged greater activity in specification development and committee work.

Prof. Hardy Cross, University of Illinois, was awarded the Wason medal for the most meritorious paper for his contribution of last year entitled "Why Continuous Frames?" Wason medals for research went to Douglas E. Parsons and A. H. Stang, of the Bureau of Standards, and to Commander Ben Morecll, U. S. Navy, for tests of Messnager hinges. A. E. Lindau, Chicago, was elected to honorary membership.

A new building code

Overshadowing all other activities at the convention was the adoption of a new set of building regulations for reinforced concrete. Accepted as an amendment to the tentative regulations in force since 1928, the regulations will come up for final adoption at next year's convention, but in the meantime they are officially in force.

The changes from the old regulations are so numerous and extensive as to preclude more than partial listing, except for the most important innovation—the incorporation of new column design methods based on the extensive series of tests carried out at Lehigh University and the University of Illinois.

The new code consists of twelve chapters titled as follows: general, materials and tests, concrete quality and working stresses, mixing and placing, forms and details of construction, design considerations, flexural computations, shear and diagonal tension, bond and anchorage, flat slabs, reinforced-concrete columns and walls, and footings. In the interests of durability and better concrete, all concrete exposed to the weather (except in mild climates) is required to have an ultimate 28-day strength of 3,000 lb. per sq. in. Water-cement ratio proportioning is required for all concrete whether made under average or controlled conditions. The allowable unit stress for wire mesh and for bar reinforcement not over ¼ in. in diameter, when used in one-way slabs, is increased from 20,000 to 30,000 lb. per sq. in. In recognition of higher-strength concrete, a set of working stresses based on a 3,750-lb. per sq. in. ultimate strength is included for the first time; formerly 3,000 lb. was the maximum recognized by the code.

In the chapter on design, more detailed instructions on handling wind forces are given than were in the previous regulations. Changes made in the flexural computations for members spanning in one direction afford a better opportunity to utilize the principles of continuity that have recently come into general acceptance. Entirely new are the requirements for the design of two-way slabs supported on four sides.

Although the regulations, developed by a committee under the chairmanship of A. W. Stephens of New York, are probably 75 per cent rewritten or wholly new, they were adopted by the convention with only incidental discussion, except as to the chapter on columns. Two full days of discussion in the committee failed to bring an agreement on the permissible load formula, and the debate was continued on the floor of the convention. A compromise—by raising the safety factor in the formula—permitted the chapter to get the required majority of votes. The formula, however, remains basically unacceptable to a considerable number of the membership, largely by virtue of the fact that it considers the concrete outside the spiral reinforcement as part of the effective section instead of as fireproofing only.

Without going into detail concerning the contents of the chapter, it may be pointed out that it is based on the results of the column tests begun in 1929 at Lehigh and Illinois (*ENR*, May 26, 1932, p. 764) and was written by a subcommittee under the chairmanship of Prof. F. E. Richart, of the University of Illinois. The expression for the ultimate strength of a spirally reinforced column that was deduced from the above tests was made up of the core area multiplied by three factors as follows: 85 per cent of the ultimate strength of the concrete control cylinders plus the yield-point strength of the vertical steel times the percentage of vertical steel, plus the yield-point strength of the spiral steel times the percentage of spiral steel times an effectiveness ratio 2. One respect in which this expression differs from that used under previous regulations is that it includes a factor for the strength of the spiral.

For purposes of the new building regulations the ultimate-strength formula was reduced to a permissible load formula by the application of a factor of safety. In addition, the committee decided to eliminate the factor referring to the spiral strength as a definite part of the formula but to compensate for this by using the gross area of the column instead of the core area. The effect of this, it is maintained, is to recognize that the spiral is ineffective until the shell over it has been removed —for example, by fire—but that the spiral then comes into play and replaces completely the strength of the shell.

The resulting form of the formula is $P = Ag\ (0.22f'_c + f_s\, p_g)$ in which f_s is 40 per cent of the yield point of the vertical steel, p_g is the ratio of vertical steel to gross area and f'_c is the ultimate strength of the concrete. Before the compromise referred to above was effected, the factor 0.22 in the formula was 0.25, and f_s was taken as 45 per cent of the yield point.

The formula, it will be noted, disregards the spiral reinforcing. This is taken care of by a special formula for minimum spiral: $p' = 0.45\ (R\text{-}1)\ \frac{f'_c}{f'_s}$ in which p' is the ratio of the volume of the spiral to the volume of the concrete core, R is the ratio of the gross area to the core area, and f'_s is the useful limit stress of the spiral (40,000 lb. per sq. in. for rods and 60,000 lb. per sq. in. for cold-drawn wire). This minimum spiral is intended to equal the strength of the shell, 1½ in. thick or greater, which might be damaged by fire.

Objections to the new design method are that it permits much higher loads than previously and thus is too radical a step to take so abruptly. This is the viewpoint of A. R. Lord and others. Prof. M. O. Withey, of the University of Wisconsin, who apparently expressed the viewpoint of a considerable group of members, maintains that the use of gross area is illogical and dangerous; the shell should be considered only as fireproofing both in spiral and tied columns. Further, he believes that the formula for permissible load should reflect directly the contribution of the spiral; this, he maintains, would make the formula more intelligible and in addition would permit the use of a low ratio of spiral reinforcement, which is not possible if the spiral must equal the strength of the shell. The adopted spiral steel formula also is held to penalize (on a cost basis) the spirally reinforced column as against the tied-reinforcement column. It may be noted that the new regulation determines the maximum permissible load on tied columns by means of the same formula used for the spiral columns except that only 70 per cent of the value so obtained is utilized.

In bringing about the compromise which permitted adoption of the chapter, T. L. Condron, Chicago, emphasized that he agreed with many of the objections to the formula, but he felt that it represented an advance and with the increased factor of safety would be amply safe. After eight years of study and the expenditure of large sums of money on column research, Mr. Condron pointed out, it would be a reflection on the Institute if it could not agree to use the results that it had obtained.

Longer life for concrete

The close relationship between durability of concrete and the repair of concrete structures was recognized on the program by grouping papers on these subjects in a single session. Profs. C. H. Scholer and E. R. Dawley, Kansas State College, presented the durability papers. Maintenance and repair were discussed by R. B. Young, of the Hydro-Electric Power Commission of Ontario; J. Lamprecht, of the Northern New York Utilities Inc.; H. G. Roby, of Byllesby Engineering & Management Corp.; and F. W. Capp, of the Portland Cement Association.

Extensive research on durability has been carried out at Kansas State College for over fifteen years, and while much has been learned the subject is still wide open and conclusions from tests must still be stated with indecision, according to Professor Scholer. The factors, for example, which must be dealt with in diagnosing concrete and making concrete are those of cement, water, aggregate, time, temperature and energy used in mixing. While cements that promote plasticity and workability aid durability, Professor Scholer does not expect that change in cement composition alone will produce radically better concrete. Loss of water or bleeding may leave planes of weakness between mortar and aggregate; on the other hand, removal of excess water by various means produces a dense concrete that is unquestionably more durable than that made from wet mixes. Aggregates make up most of the volume of concrete, and thus their own durability is important to the resulting concrete; Professor Scholer believes the surface characteristics of the aggregate play an important part in bleeding and the development of planes of weakness. Satisfactory temperature for proper hydration and sufficient time for curing are other durability factors. Finally, unless proper mixing and placing procedures are used, durability is bound to suffer.

With so many variables whose correct relationship one to another or whose relative importance is unknown, any attempt to standardize on method of durability testing (as is suggested from time to time) is obviously premature. For example, it is impossible to set a numerical limit on the number of cycles of freezing and thawing necessary to demonstrate a good concrete; yet the test is used, and in Professor Scholer's opinion is useful, but not in a quantitative way.

Also, there are some difficulties in interpreting results from freezing and thawing tests. For example, there is a question as to how much of the destructive action that takes place is due to temperature change and how much to the expansive forces of the ice within the specimen. Heating and cooling tests afford a method of divorcing temperature effect from ice formation effect, and Professor Dawley outlined a series of tests based upon this fact. Heating was by steam, cooling by tap water. Mortar specimens were used to speed up the work, although preliminary results showed that coarse aggregate concrete does not crack as badly as mortar. The 750 specimens of 3x6-in. cylinders, in three mixes (1:4½, 1:3½ and 1:2) made with seven cements—both portland and high-early-strength and a granitic sand were placed in a copper tank, so that the tops were immersed 1 in. Steam and cold water were admitted alternately at 30-min. intervals. The average high temperature was 166 deg., the average low temperature 70 deg. Tests showed that this 96-deg. cycle gave comparable results to a 50-deg. cycle with a maximum temperature of 120 deg. Stainless-steel plugs in the ends of the cylinders permitted measurement of change in length.

Studies were made of the effect of a minimum of 200 and a maximum of 4,000 cycles of heating and cooling. The results showed that the compressive strength is reduced more rapidly during the first few cycles than later; however, the strengths of all cylinders were reduced except those made with portland cements in the rich 1:2 mix; in these the strength increased. The strength of a calcium aluminate cement mortar was most adversely affected by the heating and cooling, although this same cement is the most durable in the freezing and thawing test. The expansion and contraction of this specimen under heating and cooling was comparatively small. The three most durable cements in the heating and cooling tests had the highest silica contents. These same cements showed the least expansion. All specimens gained in weight. The portland cements exhibited the smallest permanent increase in length; at 4,000 cycles for the two cements used, this averaged 1.4 and 1.75 in. per 100 ft.

Surface checking is a characteristic result of the test; also the formation of calcium carbonate at the cracks. Lean mixes are more adversely affected as to strength, length and weight increase than are rich mixes. It was concluded that heating and cooling between 70 and 166 deg. is less detrimental than freezing and thawing between —10 and +70 deg. F. No other comparisons or conclusions were drawn from the results.

Concrete repair

The papers on maintenance and repair of concrete structures brought out general agreement on a number of points which may be briefed as follows: There is a vast amount of repair work done, and the larger part of it is poorly done. Repair of concrete structures is an engineering problem, but the owner of a disintegrating structure is not able to buy engineering advice; he can only purchase remedies and try them out. Both Mr. Roby and Mr. Lamprecht stressed the need for research and open discussion on concrete repair problems. The first step in a repair job is to diagnose the cause of the disintegration, after which the plan of attack can be worked out. A bad appearance is not necessarily a sign of unsound concrete, but it is a warning signal. Examination of concrete structures is best done just after a rain or during freezing weather, according to Mr. Capp, who also pointed out that a basic consideration in determining upon procedure is to decide whether the concrete as a material is at fault or whether the structural assembly is to be blamed.

Among the repair jobs cited, only those on dams were outlined in detail. Mr. Roby described the repair of a leaking masonry dam whose construction in 1922 had violated nearly all the principles of good practice. Since it was impracticable to drain the reservoir, a new concrete facing 2 ft. 8 in. thick was added on the down-stream face. Exceptional precautions were taken to fasten it securely. The face of the old dam was cleaned of all disintegrated concrete and roughened. Anchor bolts, to resist the full head behind the dam, were set in the dam face. Reinforcing of the new

concrete was in the form of 1-in. diameter. rods 12 in. on centers both ways. Before pouring, the old surface was sandblasted to remove organic material; it was then washed and blown clean with compressed air. Finally, just ahead of each pour the surface was washed again, a brush coat of mortar was applied, and on top of this handfuls of mortar were thrown against the face. In two years no evidence of loosening of this new concrete face has been found.

Easier and more certain repair can be effected if it is possible to waterproof the upstream face of a dam. Mr. Lamprecht cited four methods that he has used: (1) use of a 1:2 cement-sand plaster in two coats about $\frac{1}{4}$ in. thick applied 24 hours apart; (2) utilization of a poured concrete wall doweled and reinforced to the upstream face of the dam; (3) brush grouting; this consists in removing all bad material and filling the holes with a mixture of poured concrete and an iron composition, after which four coats of grout using the same iron material are applied by brushing; a final coat, for appearance, is brushed on in which no iron material is used; the iron material, upon swelling, is expected to fill any cracks that may form; (4) use of air-applied concrete placed in several layers and reinforced. The last-named method is used wherever possible, since denser and stronger concrete is obtained.

Economics of high strength

A saving of 10 to 15 per cent in structural cost was shown to be possible in buildings by the use of concrete of 3,000 to 6,000 lb. per sq. in. ultimate strength, in a paper by Prof. F. E. Richart. To secure this saving safely, however, presupposes much better inspection than is now usually afforded. Most of the saving comes in the columns and footings, for in the beams and slabs higher-strength concrete generally requires an increased amount of steel. For example, in a flat slab 20 ft. square, carrying a live load of 300 lb. per sq. ft., replacement of a 2,000-lb. with a 6,000-lb. concrete reduces the concrete (slab thickness) about one-third, but it also increases the steel tonnage 45 per cent, so that the total cost is increased about 5 per cent; the only saving comes in the loads on the columns, which are reduced 9 per cent.

Beams present a similar picture, although Professor Richart presented the interesting possibility of holding the beam depths constant and reducing the width. The spacing of the longitudinal steel presents a practical limitation to the use of this idea, but in theory it results in a large saving in concrete and a small one in the longitudinal steel. Furthermore, the permissible increase in bond stress with the high-strength concrete helps to reduce the number of reinforcing bars as the width of the beam is decreased.

In columns the savings are easily attained in both spiral and tied types, with the advantage in favor of the latter. In summary it was pointed out that for tied columns, which predominate in buildings, the savings over using a 2,000-lb. concrete are 20 per cent for 3,000-lb. concrete, 33 per cent for 4,000-lb. concrete, 42 per cent for 5,000-lb. concrete, and 50 per cent for 6,000-lb. concrete. Footing savings result largely from the decreased load that comes to them.

Discussion centered on the role that the reinforcing steel would play in high-strength members. Prof. W. M. Dunnigan, Iowa State College, showed some cost curves of beams with constant width-depth ratios, to demonstrate that unless steel stress is increased along with the concrete stress the full value of the latter is not obtained. Prof. M. O. Withey, University of Wisconsin, pointed out the possibility of excessive tensile cracks with these highly stressed materials, and Prof. W. K. Hatt, Purdue, cited the possibility of breaking the bond with the steel and concrete and prestressing the steel until a sufficient compression is put in the concrete to obviate any possibility of tension cracks.

Also devoted to the subject of high-strength reinforced concrete was a paper by D. B. Steinman, of New York, on the subject of "Isteg" reinforcement, a type of bar formed by twisting two ordinary steel bars together under tension, thereby cold-working them and raising their yield point to 50,000 lb. per sq. in. or over. In Europe such reinforcing has been widely adopted during the past four years. A 27,000-lb. unit stress is permitted, and in some cases an increase in concrete stress is also allowed. Beam tests at Columbia University showed steel stresses of 50,000 to 60,000 lb. per sq. in. to be developed at failure. Cracks were smaller and more widely distributed than in beams with plain or deformed bar reinforcements. Tests for bond gave results for the Isteg bars 43 per cent higher than for plain round bars and 23 per cent higher than for deformed bars. Deflections, Dr. Steinman stated, are not greater than for conventional concrete beams, although the reason for this is not known. L. J. Mensch approved the idea of using higher-strength reinforcing but pointed out that in this country high-carbon steels are available for the purpose, while such is not the case in Europe; hence the popularity of the double-twisted reinforcement made from structural steel. In answer to a question from Prof. R. E. Richart, Dr. Steinman stated that the new type is not recommended for use in compression, although he cited its recent utilization in concrete piles in England.

New workability studies

Some new work on tests for concrete workability, under way at the Bureau of Standards, was described by Winslow H. Herschel. On the assumption that no single test can measure workability and that a separate test is desirable for each factor of workability such as wetness, mobility, shear resistance, tendency to segregation, etc., four tests have been devised.

In a test for segregation, a quantity of concrete is placed in a No. 4 sieve and jolted on the flow table 30 times after which the amount of mortar that goes through the sieve is measured.

A test for adhesion consists in placing the concrete on a steel plate and measuring the force necessary to pull it off. In this test there is the chance for inaccuracies and inconsistencies because of the effect of air or water between plate and concrete.

A test for shear resistance, adapted from one of Dr. Terzaghi's tests on soils, consists of placing the concrete in a split box, sliding one half of the concrete over the other half, and measuring the force required. It has been noted that the maximum force is not developed until after a movement of several inches. A box or frame 4x12 in. in plan dimensions is used. This has proved to be the most satisfactory of the four tests.

A test for harshness consists in determining the ratio of the slump to the flow. The spread on the flow table under two jolts is compared to the flow at 15 jolts. The ratio is designated as a coefficient of plasticity.

Concrete in construction

Several papers on construction operations were presented. Gordon Dodge, Jeffrey Manufacturing Co., described the remarkable installation of equipment at Grand Coulée Dam for producing and handling 1,000 tons of aggregate per hour. Because the local granite and basalt material is high in sand content, some 2,500 tons of material must be handled per hour—mined, transported, crushed, separated into sizes by screens and classifiers and moved to the mixers over 6,000 ft. of belt conveyors.

On the San Francisco-Oakland Bridge a huge volume of concrete for the piers had to be placed under water at depths varying from 25 to 242 ft. Stanley M. Hands, California division of highways, described the methods used and the type of concrete required (*ENR*, April 5, 1934, p. 431, and Aug. 23, 1934, p. 227). Careful selection of a mix that would be free from segregation was the key to the success of the operation. A plastic rather than a fluid mix was adopted, which contained about 2 per cent air; too much air creates undesirable turbulence when it escapes. Special attention was given to the fines in the sand, which was graded very carefully. Coarse aggregate was gravel. Typical underwater concrete was designed with 50 per cent of sand, 6 sacks of cement per cu. yd., and a water-cement ratio by volume of 0.85; this mixture contained 13 per cent more mortar than usual structural

mixes. There was practically no ¼- to ⅜-in. material in the aggregate. This size was found to cause trouble, particularly when the mixes were loaded with larger sizes.

A third construction paper was a description of the concrete pump by Charles F. Ball, chief engineer, construction equipment division, Chain Belt Co. Introduced in the United States late in 1932, the pump has handled over 2,000,000 cu. yd. of concrete to date. It is a heavy-duty single-acting horizontal piston pump, with the outlet connection directly in line with the cylinder. A supply hopper mounted above the cylinder is connected through an inlet valve described as a glorified plug cock. A similar valve is used in the outlet line. The valves are mechanically opened and closed in timed relation to the movements of the piston. The pipe line is full of concrete at all times. Concrete mixes that have been handled with pumps have had a cement content varying from 4 to 6 bags per yard. The minimum sand content has been 1,000 lb. per yard, the maximum 1,400 lb. and more. Coarse aggregate is varied from gravel up to and including anything that will pass a 3-in. square screen. Concrete with a slump as low as ½ in. has been pumped, although probably the most dependable slump is about 3 in. Maximum distance and height are obtained with concrete of 6 or 7 in. slump. Prominent among the concrete-pump installations described by Mr. Ball is that used on the Mississippi River locks and dams.

Weatherproof walls

The resistance of concrete masonry walls to rain is the subject of an investigation carried out by the Portland Cement Association and reported by R. E. Copeland. By blowing water at 25 miles per hour against panels of block 32x48 in. in size, made with ⅜-in. joints, and measuring dampness of the interior both by observation and by ohmeters attached to embedded electrodes, some interesting results have been obtained. Only by painting the walls with two or three coats of cement paint was it possible to keep the water out. On an 8-in. unpainted wall, water penetrated the front face in 5 min., and the back face in an hour. Joints usually leaked first. The paint used was made with 1.6 lb. of cement to 1 lb. of water. It was more efficient when brushed on than when sprayed. No painted 8-in. wall showed moisture on the back face after 24 hours of exposure. Walls only 4 in. thick and painted showed back-face moisture only after 2½ to 4½ hours of exposure. The most efficient wall was covered with three coats of stucco; after 219 hours of exposure there was no penetration through the front face and no moisture on the back face.

In discussion, J. C. Pearson, Lehigh Portland Cement Co., told of some stucco wall panels built a good many years ago at the Bureau of Standards, which were subjected to a driving rain for several days; even the leanest mix, 1:6, showed no leakage. L. W. Walter, Erie Railroad Co., described a repair of leaky joints between a concrete frame and brick curtain walls by the use of three of four coats of an asphalt emulsion placed on the inside. Although unsightly, it has been effective. He suggested that emulsion could be covered with aluminum paint for appearance.

D. E. Parsons announced that a series of weatherproof wall tests is now under way at the Bureau of Standards similar to the P.C.A. tests, except that several types of wall materials are being tested and a static pressure is being employed along with the water, since such a pressure can be more readily measured (for comparison with future tests) than can a pressure applied by a fan. So far the results indicate, for brick masonry at least, that workmanship is more important than materials. Stucco facings have shown uniformly high results.

Commander Moreell stated that the Bureau of Yards and Docks had recently drawn up a specification for wall practice which may be amended after the Bureau of Standards are completed but which now recommends, among other things, tooling of joints, flashing of copings and extra waterproofing around the ends of floor joists, where the wall thickness is decreased. He also pointed out that the 25-m.p.h. wind used in the P.C.A. test represents less than 2 lb. per sq. ft. pressure, which is far below what exists in most driving rains.

In other papers on concrete products, Carl A. Menzel, of the Portland Cement Association, presented an analysis of the advantages of high-pressure steam curing, and Benjamin Wilk, of Detroit, gave further data on the tests at Lehigh University of blocks made with high-early-strength and with ordinary portland cement. Results so far show that the high-early-strength cements, used in lesser quantities to make the block cost the same as with ordinary portland cement blocks, produce blocks with greater strength at all ages.

Modern cast stone

Architectural precast concrete (cast stone), which a few years ago seldom had a strength of more than 1,500 lb. per sq. in., is now required to attain 5,000 lb., and most of it tests from 8,000 to 10,000 lb. Controlled plant manufacture has brought this about, as against "back yard" casting, which unfortunately still exists, according to C. G. Walker, of the Portland Cement Association. Rich mixes (1:3 and 1:4) are generally used. Vibration has many advantages in cast-stone manufacturing, but is being accepted slowly. Much of the cast stone used serves as outside form for structural or back-up concrete. Both faced and homogeneous stones are available, and both are equally strong; faced stone should be cheaper, since the expensive aggregate and coloring are only necessary in the facing.

Another paper of architectural character was presented by Prof. F. R. Watson, of the University of Illinois, and concerned tests on the sound-absorbing value of concrete. Porous concretes perform best in this service, particularly those that have large holes in the surface through which the sound may enter and in addition contain large numbers of minute holes in the material which act as sound absorbers.

Among the committee reports presented was an analysis of the economics of ready-mix and job-mix concretes; a proposed specification for the design and construction of reinforced-concrete chimneys; and a manual of recommended practice for placing concrete by means of vibration.

PWA Nets Large Profits Through Bond Sales

THROUGH the sale of about $300,000,000 worth of securities, chiefly municipal and railroad bonds taken as security for loans to aid in financing public-works projects, the PWA has made a net profit of more than $4,750,000. To date $202,047,000 of its municipal bonds have been sold either to the public or to the Reconstruction Finance Corporation, realizing a profit of $2,770,000. Railroad securities amounting to $103,527,500 have also been resold at a premium of $1,982,000.

According to the report of the director of finance, PWA has sold about 70 per cent of the municipal bonds that it has purchased, and more than 55 per cent of the railroad securities have been sold. Securities sold consisted of obligations purchased by PWA during a period when market conditions made the sale of bonds through private channels extremely difficult and costly. The report also holds that the ability of the government to turn over at a profit these securities demonstrates an improvement in security markets. Proceeds from the sale of these securities are deposited in the PWA revolving fund, and further loans, bearing interest at 4 per cent, are made from this fund. Issues of PWA bonds sold to the public through the RFC range from $10,000 to $30,800,000 and come from every state and from the territories of Hawaii and Alaska. Included among the securities still to be placed on the market are $41,000,000 of 4 per cent bonds of the Chicago Sanitary District, $17,700,000 of 4 per cent bonds of the Triborough Bridge Authority, New York City, and several railroad issues.

ENGINEERING NEWS-RECORD

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Industry Builds Again

RUN DOWN after five years of idleness, inadequate in the face of revived business demands and in some cases obsolete because of technological advancement, the industrial plant of the nation is being overhauled. Construction at a $15,000,000-a-month rate began last April and continues at fully maintained pace. The economic significance of this rebirth of the idea of investing savings in new plant facilities can hardly be overemphasized, since this activity was the real goal of all recovery efforts since the beginning of the depression. Now that the economic mass objective is within reach we may properly ask: How well are these savings being invested? What is this 1936 model industrial building; does it measure up to its opportunities born of research and reflective thinking during the period of dormancy? An answer to these questions is embodied in a series of four articles beginning in this issue. Based on a survey of plants both large and small located in eight different states and manufacturing products varying in size from pills to locomotives, the articles give a fair cross-section of the engineering principles embodied in the enclosed acreage that will turn out the products of tomorrow. The industry renaissance gives the lie to the prophets of gloom and stagnation, for revived industry is building better, to fit itself for better service under better working conditions. In this fact industrial executives, architects, engineers and contractors may take just pride.

Well Done!

"TAKE IT, IT'S YOURS NOW"—in these few words, so the news reporters wired, Frank Crowe turned over Boulder Dam to Ralph Lowry last Saturday, and transferred the huge structure to the government complete except for some final items of power installation. The words may have been a bit different, but in any case it was a brief and simple act that terminated the $54,000,000 contract, largest ever let, and closed a remarkable chapter in construction history. In less than five years Six Companies Inc. has done a job estimated to take seven, and has done it with skill, speed and efficiency that have won worldwide admiration. The gains in the schedule were cumulative, for every major feature of the project was finished in less than its allotted time. Phenomenal progress in driving and lining the huge diversion tunnels permitted bypassing the river in November, 1932, a year ahead of schedule. As a result, with the aid of nature in keeping floods away, placing of the mass concrete in the dam started June 1, 1933, instead of December, 1934, as originally planned. It, in turn, was completed in 21 instead of 33 months, at the unprecedented rate of 160,000 cu.yd. per month. The reclamation engineers kept ahead of the pace set by the contractors, and in spite of necessary changes in design and procedure they never delayed progress. Contractors on appurtenant works and those who supplied equipment and materials for the work did their share quite as well as the chief contractor. Because this hearty cooperation of all concerned finished the dam ahead of schedule, two years of possible drought and flood on the lower Colorado have been averted, and needed power will be available two years earlier. Well done!

A Tower of Babel

THE SECRETARY OF LABOR announces a call for a national conference of representatives of industry, labor, federal and state commissions, insurance companies, technical societies, doctors, safety experts and engineers to map plans for a cooperative campaign to prevent silicosis. Out of this mass meeting Secretary Perkins hopes to achieve results against this little understood industrial disease. But in all probability hopeless confusion would be the result of such a meeting. It is true that the silicosis problem concerns all the groups mentioned, but to bring them point-blank against the problem in open meeting would accomplish nothing. The conference would be a modern Tower of Babel, for the several groups do not speak the same language or understand each other's viewpoints: As we have repeatedly said, the silicosis problem needs first of all a study by a competent and properly financed board, representing the major groups involved but small enough to work effectively. To compare the present-day silicosis problem with the problems of ordinary accident prevention, as Mrs. Perkins does, is gross misconception. Mass meetings are excellent for safety education and propaganda, but silicosis requires something quite different. It is far too complex, too involved and too little understood to be suited to mass-meeting methods.

A Man Stands Up

MANY DEVICES have been tried to keep speakers at conventions on schedule time, yet the best of societies continue to sin grievously in wasting the time of their audiences and speakers by gross disregard of schedule. Engineers, who are supposed to be efficient, should be able to apply their skill to program building and to efficient operation of meetings; yet for some strange reason efficiency is almost wholly ignored. Of the various methods of controlling speakers who lack terminal facilities, that of having a monitor stand up just prior to the expiration of the speaker's scheduled time has been tried with marked success in a few organizations. But there are societies, and meetings, in which the whole audience should stand up to enforce efficient management. A particularly irritating result of inefficiency occurs in such events as the recent meeting of the American Society of Civil Engineers, when four divisional meetings were held simultaneously. Many members with varied interests had studied the program, on which times were set down to the nearest ten minutes, and had made up their own schedules to hear papers read in more than one session; but any such foresight proved to be wasted effort, inasmuch as slow starting and overrun by speakers made the time schedule waste paper. This season of many conventions is an appropriate time for reform. Let the monitor scheme be given a trial. If a speaker will not stop when the monitor stands up as a signal that his time has expired or if the chairman lacks the good sense to uphold time limts, perhaps an alarm clock might be tried. Engineering ingenuity should not be at a loss to find means of enforcing schedule maintenance—once the will to do so is at hand.

Research and Concrete Columns

THE NEW METHODS of concrete column design included in the building regulations adopted by the American Concrete Institute last week are an outstanding example of the beneficial results of research. They represent the first change in design practice since current methods were introduced in 1917 by the joint committee on concrete and reinforced concrete. During that twenty-year interval experience and results of fragmentary testing had accumulated which cast serious doubt on the efficiency if not the logic of the approved methods. In 1929, therefore, an extensive series of tests was inaugurated at Lehigh University and the University of Illinois.

The result of this investigation is well known. It demonstrated that the strength of a spirally reinforced-concrete column is made up of three factors—85 per cent of the control-cylinder strength of the concrete in the core, the longitudinal steel at its yield-point stress, and the spiral at its yield-point stress times an effectiveness factor of about 2. Under sustained loading, it was found, the concrete unloads onto the steel, upsetting the time-honored assumption of a constant ratio of steel stress to concrete stress and causing the term n, included in the old column formula, to lose its meaning. Fortunately this redistribution of stress does not produce a change in the load-carrying capacity of the column, so that the safety of existing columns is not impugned.

These important facts have now been translated into a permissible load formula. Since matters of economy (principally the competitive position of spiral and tied columns) and of safety factors are involved, it is natural that unanimous approval is not immediate. The framers of the formula chose to reflect the contribution of the spiral by considering the shell concrete to be effective load-carrying area; others think the spiral contribution should be expressed directly in the formula and that the shell should be considered only as fireproofing. With a particular proportioning of spiral, of course, the results of the two methods of calculation are the same.

The remaining differences of view will no doubt be adjusted during the coming year. But regardless of the outcome it is salutary that the new design method is now brought out into the open and given a representative status instead of being referred back to the committee for further study. Too much important and useful information in every specification-making body in the land reposes for too long in the cloisters of the specialists.

When we consider the interesting technical questions involved in the new column formula, it is worth noting that questions of engineering judgment are involved. The strength of a structural member so complex in character as a column is not to be determined by mathematical formula, of course, but is controlled by the incidents of practical service. Only when service conditions are given full consideration by the engineer can he depend on his design as safely grounded.

In the case of the concrete column, the first thing to bear in mind is that during normal service the external shell, or fireproofing, is intact and carries load, and that, if the normal loading continues for only a short time, the spiral is out of action. Long-time loading changes this state of affairs; the plastic yield of the concrete brings the spiral into action and no doubt weakens the fireproofing. Let it be assumed, however, that the shell remains in full action and the spiral remains without effect, in the normal service of the column. It is necessary, then, to consider special conditions, such as fire—which may not occur in the life of a structure but undoubtedly should be kept in mind in every case as a possibility. Fire destroys the integrity of the concrete shell; in due course it also brings the spiral into action, though whether the spiral is effective while still hot from exposure to the fire may be questioned.

The emergency strength of the column, then, is measured by core strength, disregarding the shell. How much reserve strength a column should be expected to have during or after a fire is a matter subject to difference of opinion; but no one will deny that it should be able to stand up even during the heat of the fire, when the spiral may be out of action because of its expansion, or that after the fire it should retain sufficient reserve strength to make the structure safe for repair.

In other words, both normal continued-load service and emergency service of concrete columns are directly related to core strength. The shell, on the other hand, may contribute to resistance against such influences as stress set up by short-time load, wind, shock, mechanical injury and minor fires. Since good judgment is required to evaluate these effects, it is evident that a mere formula cannot be depended on to produce safe columns.

Finally, it should be remembered that the sources of uncertainty and variation inseparable from concrete construction emphasize the limitations on the applicability of mathematical procedure in designing concrete columns. They argue for conservatism. Moderate stress values and adequate safety margins for contingencies are therefore likely always to remain primary elements of good concrete column practice.

A Lesson in Snow Control

BETWEEN the lines of the story of highway blockades published last week and in this issue lies evidence of the need for fuller study of snow control. Removing the fallen snow from the road is only part of the work. The important preparation includes: (1) determination of deep snow areas and drift prevalence; (2) rational location of snow barriers, and (3) design of roads to be self-clearing and easy to clean when obstructed.

Together with useful facts about equipment and methods for snow removal, the storms of the last two months furnish vital information on the problem. They again make it plain that quietly falling snow is seldom a serious obstacle; drifting is the real problem, and snow control is essentially a matter of drift prevention. Perhaps the development of means of drift prevention awaits the time when highway management will become more operation-conscious, but the experiences of this winter point the way to progress. More effective use of windbreaks based on comprehensive snow surveys, and road design that will reduce opportunities for drift accumulation and provide room for drift removal, are first essentials.

Highway maintenance departments, which fought so well against heavy odds, deserve the aid of design and construction to reduce these odds. They can be reduced by raising roadbeds on plains roads, by wider cuts and flatter transverse profiles, and by plantings and snow fences to induce off-road drift formation. All these devices have proved their value; none of them will replace efficient snow-removal crews, but they will reduce the work of these crews and help keep traffic moving.

CURRENT NEWS

Substitute Offered For Walsh Bill

New bill introduced in Congress is aimed at overcoming difficulties of the Walsh bill by simplified provisions

REGULATION of wages and hours of labor on all contracts with the federal government, subject of the Walsh Bill, which passed the Senate last session, is brought up anew in a bill introduced in the House on March 2 by Representative Healey of Massachusetts, chairman of a subcommittee which has been making a study of the subject.

Immediate enactment of the substitute measure during the present session is urged by its sponsor to prevent labor gains under NRA from "being entirely wiped out." Rep. Healey referred to a report by the Government Contracts Division of the Department of Labor submitted to his committee stating that of 3,507 firms investigated 37 per cent had increased hours and 42 per cent had reduced wages after the Schechter decision invalidated NRA.

Provision simplified

Although modeled after the Walsh Bill, the Healey substitute is somewhat simplified, eliminating as impracticable many provisions of the former including all retroactive requirements on labor standards and any application of the measure to contracts financed through federal loans or grants to non-federal agencies. References to NRA labor standards were also dropped. The requirement that subcontractors and material men must comply was retained, but the general contractor can relieve himself of liability by notifying these that they are engaged on government work. Penalties are the same as in the Walsh bill.

The Department of Labor is designated as the administrative agency and it is recommended that the new measure be closely coordinated with the Bacon-Davis Act in administration. In setting wage and hour standards the language used conforms closely with that in the uniform model state minimum wage acts and in court decisions upholding the limitation of hours of employment.

The two-year limitation contained in the Walsh bill has been omitted, since it is the view of the committee that the proposed law should be on a permanent basis supplementing the Bacon-Davis Act, which applies only to public works construction.

Open hearings on the new measure will be held during the present month, according to Representative Healey.

Temporary Injunction Blocks Municipal Power Loan

A temporary injunction blocking a PWA loan and grant of $300,000 to the village of New Hyde Park, N. Y., for the construction of a municipal electric power plant was granted Feb. 27 by the District of Columbia Supreme Court. The suit was brought by the Long Island Lighting Co., which contended that an investment of $213,000 would be jeopardized.

Ten similar suits in the same court affecting municipal power projects in Alabama, Texas, Oklahoma and Vermont will be tried March 30. The date was set after a plea by PWA attorneys for early action to clear the way for employment on the projects. Copies of the decision upholding the right of the federal government to assist in financing local power projects have been sent to government attorneys in all PWA power cases now in litigation for incorporation in court records.

Construction of Aurora Dam On the Tennessee Opposed

Construction of a dam at Aurora Landing about 65 miles above the mouth of the Tennessee River is not as desirable as the construction of a dam at one of several nearby sites, according to C. A. Bock, assistant chief engineer of the Tennessee Valley Authority, in a report to Arthur Morgan, chairman of the authority. Construction of a combined power and navigation dam at Aurora Landing has been advocated locally for some time. Private interests having certain rights at the dam site when the TVA was established undertook to promote its development for power independent of the TVA system but subsequently sold out their rights to the TVA. Since then the engineering department of the TVA has been actively studying the whole navigation and power situation in the area around Paducah where the Tennessee and the Cumberland join the Ohio and flow west a few miles to join the Mississippi.

Instead of building a dam at Aurora Landing Mr. Bock favors the construction of a dam at Gilbertsville, nearer the mouth of the river of sufficient height to provide for 9-ft. navigation up to the dam now being built at Pickwick Landing. Such a dam would open the river to 9-ft. draft vessels from the Ohio and yet would in no way preclude the construction of other dam on the Ohio for flood control, navigation and power. Only secondary power can be developed at Aurora because of backwater from the Ohio.

John Page Becomes Acting Reclamation Head

John Page was named acting commissioner of the Reclamation Service, effective March 2, so as to permit R. F. Walter, chief engineer, who has been acting since the death of Dr. Elwood Mead, to return to the Denver office. Mr. Page was brought into the Washington office last June and in an administrative reorganization of the bureau became chief of the engineering division.

Coshocton Water Found Sanitary

Outbreak of gastro-enteritis in Coshocton, Ohio, on Feb. 18, resulted in a health survey showing water to be satisfactory

AN OUTBREAK of intestinal ills reaching epidemic proportions on Feb 18 and 19, caused the Ohio State Department of Health to investigate the Coshocton water supply as the possible source of the malady which was sweeping the town. Test samples of the water supply produced by the department on Feb. 20 showed water to be of satisfactory sanitary quality over the entire distributing system of the city. The department held that the city water was safe for domestic consumption and that while it was possible that, in view of past history, flood waters seeped into the well structures, it is quite likely that the water supply was not responsible for the outbreak of intestinal troubles.

Sickness follows thaw

After almost a month of low temperature conditions, with many days of sub-zero temperature, on Feb. 14 a rise in temperature resulted in a short thaw, causing ice to jam at many points and causing the flooding of limited areas behind the dam. On Feb. 18 and 19 there were reported from Coshocton the prevalence of intestinal illness which reached epidemic proportions, affecting 600 school children and 900 adults throughout the city. Investigation by the state department of health failed to show that milk or other food common carriers were the cause of the outbreak, and thus it appeared that if the outbreak were not a form of influenza, the only common medium that could cause the outbreak would be the public water supply.

Accordingly the health department conducted a survey of the water supply which is obtained from one dug well, ten small drilled wells and a 24-in. drilled well all located on about one acre of ground near the junction of the Walhonding and Tuscarawas Rivers. The wells, including the dug well, extend to the surface of the ground where they are capped, and water is pumped through a common header and main. As a result of the short thaw, ice that jammed at the junction of the two streams had raised water levels so as to flood the well field. Although at the time of the investigations water in the rivers was clear, it is possible, in view of past history, that the flood waters had seeped into the well structures.

Distribution system checked

Upon investigation of the distribution system there were found six industrial plants having private water supplies and five of these plants were found to have direct cross-connections with the public water supply, protected only by check and gate valves. Since, however, there had been no broken mains or fires in the fifteen days prior to the survey, no occasion was af-

ided for the introduction of private supies into the public water supply system. nalyses indicated that residual chlorine isted at sampling points in the center of e city but that no residuals existed in the tlying sampling points. Eight bacteriogical samples were collected on Feb. 20 d nine on Feb. 23. All of these samples ere reported as negative for the presence B. coli and all but one were negative in e presumptive test.

Results of survey

As a result of its studies the health department concluded that owing to the nature of the development and the location of the public water supply, it was possible that flood waters could enter the system, but as the report pointed out, chlorination as practiced normally would effect the sterilization of the water except where the water was turbid or where a toxic substance was present or where unusual pollution was present in the flood water. The report also stated that the fact that samples collected three days after the epidemic were, without exception, of satisfactory quality, in part precludes the likelihood that the water was of bad enough quality to have been responsible for the outbreak. It was also held improbable that any of the cross-connections mentioned were the cause of the outbreak. The work was carried out under the direction of F. H. Waring, chief engineer.

TVA Announces Personnel Changes

In addition to the appointment of Lee G. Warren as project engineer at Chickamauga Dam, announced last week, the Tennessee Valley Authority has announced four other personnel changes.

Charles A. Lee, Jr., has been appointed construction engineer at Guntersville Dam. Mr. Lee has done considerable research work on the development of power on the St. Lawrence River. Olaf Laugaard, formerly city engineer of Portland, Ore., and later with the Reclamation Bureau on the construction of Parker Dam, has been appointed general office engineer for the TVA. N. W. Bowden, principal hydraulic engineer, and E. L. Chandler, senior hydraulic engineer, have been selected to assist Sherman M. Woodward, chief water control planning engineer. Mr. Bowden has conducted improvement studies on the Ohio River and its tributaries and the Lake Erie-Ohio River Canal.

In the news item that appeared last week concerning Mr. Warren's appointment as project engineer, Tygart Dam was erroneously reported as being built for the TVA.

Transportation Fellowships Offered by Yale

Three fellowships in transportation have been offered by Yale University, New Haven, Conn., for the coming school year. The fellowships each provide $500 for graduate study in the field of transportation. Applications for these fellowships should be in the hands of the Registrar of the Graduate School, York St., New Haven, Conn., on or before March 15.

Housing Plans Ready For Congress

Assured return is offered to attract capital to low priced field in an attempt to prevent overbuilding in higher priced field. More careful construction expected through mortgage requirements binding on contractor

Washington Correspondence

DRAFTED in definite terms and aimed at definite objectives, the administration's new housing program is ready for Congress. In furnishing the incentive of "easy money" for private construction of new houses, it puts the inducement where the market is greatest—in the low-price range with $5,000 as the top for families in the $1,500-$3,000 income bracket.

For families that cannot afford either to buy houses at any price or to pay an economic rent, the new legislation recognizes the necessity for public housing to be built by local authorities aided by federal subsidy in the form of grants and loans.

Plan will aid construction

President Roosevelt's advisers do not concede that there is any conflict between their recommendations for public and private housing. Construction supported by subsidy, they assert, is just as much a factor in the national income as private housing. Public housing furnishes a market for just as much materials and affords as much employment per dollar as private work.

The President's projected program to stimulate both public and private financing is based on the conviction that the construction industry needs all the construction it can get and the country needs all the housing it can get. New building eventually must cover a deficit estimated at 2,000,000 houses piled up during depression years, as well as the anticipated requirements of increasing population—400,000 to 500,000 new houses a year in urban areas alone during the next ten years.

Just as strong as their emphasis on volume, however, is the resolve of housing officials to restrict the attraction of assured return and complete security only to investment capital that goes into the low-priced field. The market for higher-priced houses is already opening up.

More new houses for more people is the object in authorizing the Federal Housing Administration to insure loans up to 90 per cent on houses built and sold for not over $5,000 during the next year or eighteen months. Because of the narrow margin between appraised value of the property and the mortgage debt assumed by the purchaser who pays down only 10 per cent, the builder will be required to stay on the contract until the mortgage is paid down to 75 per cent. If the bank is satisfied that the builder is a good risk, FHA will accept the mortgage for insurance.

The builder, knowing that he has to stay on the mortgage for two or three years, presumably will build more carefully. This means satisfaction for the buyer, as the effects of slipshod construction usually show up within a comparatively short period after a house is built. Further assurance of sound construction are FHA's property standards, to which the job must conform.

Past experience has demonstrated the low risk on mortgage loans on homes costing less than $5,000 but to increase the attractiveness of the investment, the out-of-pocket costs of the mortgages in event of default by buyer and builder before the mortgage is paid down to 75 per cent, will be covered by debentures issued by FHA. Mortgagees now are reimbursed in case of default by debentures representing the unpaid balance of the principal plus 3 per cent from date of instituting foreclosure, but get only a certificate of claim covering other losses and costs.

National banks and federal savings and loan associations will be authorized to make 90 per cent loans under these conditions. Many state-chartered institutions may not be able to do so until enabling legislation is enacted by state legislatures. In numerous states laws previously enacted in harmony with the National Housing Act are sufficiently broad to anticipate amendments to the federal statute.

A new amendment to the act is designed to persuade lending institutions to make construction loans, thus setting up more builders in the business. This would be accomplished by having FHA's commitment to insure the mortgage take effect from the date that the building operation commences, rather than on date of its completion, the present practice. If the builder fails to complete construction, the mortgagee will have the option of completing and selling the building, or calling upon FHA to take it over as defaulted.

Other amendments will carry FHA beyond the single-family house into subdivision development through insurance of blanket mortgages from $100,000 to $10,000,000. FHA's present activity in large-scale housing operations is confined to insuring the mortgages of state or local housing authorities and limited dividend corporations.

Financing large operations

Private large-scale housing operations require a type of financing that few institutions are either willing or able to undertake at present. Except in New York City, most of the mortgage companies and mortgage bond companies have gone out of business. To supply the need for large-scale financing, national mortgage associations organized under the National Housing Act will be authorized not only to buy and sell insured mortgages but to make loans directly on blanket mortgages by selling their debentures on the market. Such financing would cover whole blocks of construction and as single houses are sold, regular lending institutions would take them over on individual mortgages in accordance with commitments entered into before the operation is started. Subdivision development so financed will be subject to a price per unit of $5,000 for single family houses and some comparable figure for multiple-family structures.

If sufficient private capital does not rally to the national mortgage associations (the law requires subscription of $2,000,000 for organization), large-scale subdivision operations will be financed by the RFC mortgage company.

Apart from the main elements of the legislative recommendations to stimulate house construction is the provision for extending FHA's modernization credit plan until next December.

Wisconsin Engineers Meet at Madison

State society discusses steam power plant, waterway, mapping and concrete vibration at annual convention in Madison

FEATURED by two symposia, one on the new Port Washington power plant of the Milwaukee Electric Railway and Light Co. and the other on the Upper Mississippi Waterway, the annual convention of the Engineering Society of Wisconsin, held in Madison Feb. 20 and 21, was not affected as to attendance by subzero weather and partially-blocked highways. Other topics covered included mapping of the northern counties of the state, the 1936 highway program, vibration of concrete, and a decision to poll the membership on the question of joining the American Engineering Council. Members present voted favorably.

The Port Washington plant, which has an initial capacity of 80,000 kw. and will have an ultimate capacity of 400,000 kw. with steam pressure at 1,230 lb. and temperatures of 825 deg. F., depends upon a single boiler, equal in capacity to 48 boilers of the type and size installed by the company 25 years ago. Dependence upon a single boiler is the result of exrerience at the Lakeside plant, where the boilers have a 94 per cent service record. The new plant, according to Montrose K. Drewry, assistant chief engineer of power plants, will have a relatively high thermal efficiency. The boiler is expected to reach 45 per cent; the equipment will reduce this to 37 per cent; the overall efficiency will reach 30 per cent.

Power is produced by a single turbine-generator unit, whose design was made difficult by the problems introduced by size, high temperatures and high pressures. It was necessary to find metals that would not "creep," that is, lengthen permanently under the severe conditions.

River work symposium

The locks and dams now being constructed on the upper Mississippi River will provide a dependable 9-ft. channel and will benefit wild life along the river, in the opinion of Major Dwight F. Johns, district engineer for the St. Paul U. S. Engineer office, who arranged the symposium on the engineering features of the improvement. The total cost has been estimated at $124,000,000 and the annual maintenance at $1,725,000. Twenty-five locks and sixteen dams, out of a total of twenty-six locks and dams, have been completed or are well under way at present. Engineers from the St. Paul office who presented papers during the session were: Hibbert M. Hill, senior engineer; John C. Babson, associate engineer; Edward F. Brownell and Leonard H. Dicke, assistant engineers, and Leo M. Buhr, engineer. William Z. Lidicker, associate engineer, prepared a paper on the design of the roller gates but was unable to present it because of his transfer to Tucumcari, N. M.

The operation of the pools, Mr. Dicke explained, is based upon the position maintained by the federal authorities that, in the interest of navigation, the water level can be held at the line of ordinary high water without rendering the government liable for damage therefrom. A control station is established 15 miles above each dam. During moderate floods water is drawn down at the dam sufficiently to hold the level constant at the control station, but the drawdown is limited to prevent damage to fish and game.

Surveys for that part of the improvement lying between Lynxville, Wis., and St. Paul, Minn., involved the retracing of 1,300 miles of section line and taking topography on 230,000 acres of difficult ground. Surveys were based on a grid system that was tied in to Coast & Geodetic Survey triangulation surveys. Chief dependence was placed upon ground surveys, although maps from two previous aerial surveys were used to assist ground parties.

The northern counties of Wisconsin now have an accurate control for the mapping of those areas, according to John Ockerman, of the Wisconsin Conservation Commission, who outlined the triangulation survey recently completed with the fire towers in state and county forests as observation points. The survey extends across the northern tier of counties and also covers an area in the central part of the state. An immediate benefit accruing from the survey is that fires can now be located accurately.

Highway program outlined

The 1936 highway program for Wisconsin was outlined by E. L. Roettiger, state highway engineer, who stated that it will include construction to the amount of $16,000,000 or equal to the 1934 and 1935 programs combined. In the program are twenty grade separations totaling $4,000,000. It is planned to have 90 per cent of the work under contract by July 1.

The vibration of concrete was demonstrated by Prof. Morton O. Withey and Kurt Wendt, in the laboratory of the College of Engineering. Both internal and external vibration was used, at speeds varied between 3,500 and 7,200 r.p.m. The experiments were arranged to show the degree of compaction attained and the distance to which the effect could be transmitted. Speeds between 5,000 and 6,000 per minute seemed to be most practicable, although it has been claimed that speeds of 20,000 r.p.m. have been used in Europe.

Newly elected officers for the ensuing year are as follows: President, Robert M. Connelly; vice-president, Robert C. Johnson; trustees, Clarence A. Willson and Herbert O. Lord.

Lafayette College Celebrates Founding of Engineering School

The 70th anniversary of the founding of the engineering school at Lafayette College is to be celebrated March 18 to 21. An engineering and industrial exhibit in the college buildings and laboratories is to be open to the public for those four days and March 20 is to be given over to a series of special meetings and events. Speakers from outside the college faculty include Charles F. Kettering, president, General Motors Research Corp.; A. H. Fuller, head of the civil engineering school at Iowa State College; Robert I. Rees, assistant vice-president, American Telephone and Telegraph Co.; William E. Wickenden, president, Case School of Applied Science, and Willard Chevalier, vice-president, McGraw-Hill Publishing Co.

Senate Expands Reclamation Work

Many projects cut from the Interior Department bill in the House for lack of authorization restored by the Senate

PROVISION for authorizing and continuing construction of reclamation projects initiated with emergency funds is included in the Interior Department appropriation bill as amended by the Senate. With one exception, all these projects were included in the President's budget estimates, but not in the House bill, because several of them had not been authorized, and leaders in charge of the legislation were apprehensive that an authorization bill might be blocked. It is expected, however, that the House, which cannot appropriate without first authorizing, will accept the Senate's action.

Seven projects authorized by the amendment sponsored by Senator Hayden of Arizona, are Central Valley, Cal.; Carlsbad, N. M.; Deschutes, Ore.; Roza Division, Yakima project, Wash.; Provo River, Utah; Casper-Alcova, Wyo.; and Grand Lake Big Thompson Diversion, Col. Appropriations are made for carrying on construction of all the projects authorized by the amendment, with the exception of Grand Lake Big Thompson Diversion, as follows: Central Valley, $16,000,000; Carlsbad, $900,000; Deschutes, $450,000; Roza Division, Yakima, $2,500,000; Provo River, $1,750,000; and Casper-Alcova, $4,000,000. The Hayden amendment also carries appropriations for previously authorized projects not included in the House bill, as follows: Gila, Ariz., $2,500,000; Salt River, Ariz., $2,300,000; Grand Valley, Col., $200,000; Payette Division, Boise, $1,800,000; and drainage, Boise project, $160,000; Owyhee, Ore., $400,000; Grand Coulee, Wash., $20,000,000; Columbia Basin surveys, $250,000; Riverton, Wyo., $900,000; and Heart Mountain Division, Shoshone, Wyo., $1,000,000.

Some items cut

Informed by R. F. Walter, Acting Commissioner of Reclamation, that the original budget estimates in some instances were larger than necessary to carry on the bureau's construction schedule in the fiscal year commencing July 1 next, the Senate committee pared down several projects as follows: Owyhee from $900,000 to $400,000; Central Valley from $18,000,000 to $16,000,000; Grand Coulee from $22,000,000 to $20,000,000; Provo River from $2,750,000 to $1,750,000; Casper-Alcova from $4,500,000 to $4,000,000; and Shoshone from $1,750,000 to $1,000,000.

The amendment carries an appropriation for administrative expenses of $2,500,000, a reduction of $350,000 from budget estimates.

More funds for surveys

The appropriation bill, as amended by the Senate, increases the appropriation for topographic surveys from $440,000 carried by the House bill to $650,000 and provides that the Secretary of the Interior submit to the next session of Congress a program for expediting topographic mapping within a period of years together with an estimate of its annual and total cost. The appropriation for stream gaging is increased from $660,000 carried by the house bill to $791,317.

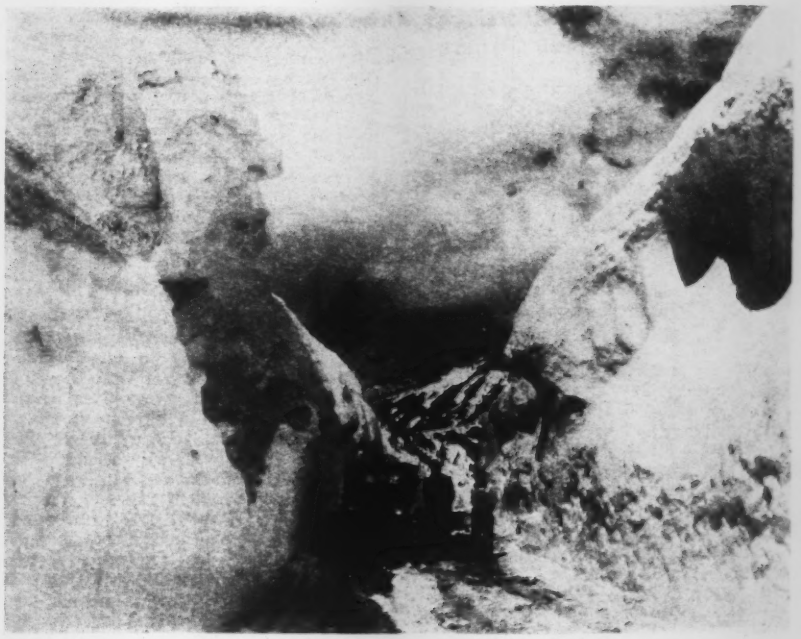
Boca Dam Construction Nears as Water Rights Are Approved

Attorney General Cummings has approved the proposed decree which will finally determine the water rights on the Truckee River in Nevada and terminate litigation begun in 1913 in the case of the United States versus the Orr Water Ditch Co. The form of contract between the various water users also was approved.

The decree and contract now will be submitted to the Truckee-Carson Irrigation District and the Washoe County Water Conservation District for approval and presentation to the federal district court of Nevada for final action. Settlement of the disputes is necessary before the Reclamation Bureau can negotiate a repayment contract with the Truckee-Carson Irrigation District and undertake construction of Boca Dam on the Little Truckee River. For which the PWA allotted $1,000,000. It will be necessary for the two irrigation districts involved to hold elections upon approval of the decree and contract. The Bureau will be ready to begin construction of the dam within a few weeks.

All-American canal lining

A contract for placing a compacted earth lining in two sections of the All-American Canal, under construction by the Bureau of Reclamation has been awarded to David H. Ryan, of San Diego, on his bid of $99,150. The bid was the lowest of five. The contract calls for placement of 225,000 cu. yd. of compacted earth lining and 81,000 cu. yd. of uncompacted earth lining in one 3-mi. and another 8-mi. section of the canal. The sections to be lined are between 8 and 23 miles from the head of the canal.



HIGH UP IN THE HILLS

Sweeping winds in the mountains of Washington have filled the passes with drifting snow. The picture is typical of highway conditions in the central part of the state. U. S. Weather Bureau figures for Feb. 10 showed a snow blanket of almost 13 ft. in this area. Clearing the roads is a continual process as drifts and slides block the narrow passes after they have been opened up.

Northwest Planning Group Discusses Power Markets

Experiments in house heating with electricity were outlined at a meeting of the Pacific Northwest Regional Planning Commission held in Spokane, Wash., on Feb. 13-15. The conference, which was presided over by Marshall N. Dana, chairman of the planning commission, was attended by 519 persons from Washington, Oregon, Idaho and Montana. After an opening session the conference was divided into ten group meetings for the purpose of discussing technical reports pertaining to each division. The water resources and power group held four sessions under the chairmanship of H. V. Carpenter, dean of the school of engineering, Washington State College.

The farm as a power market was discussed by D. B. Leonard, electrical engineer, Pacific Power & Light Co., who pointed out that the chief difficulties in the way of continued extensive development in rural electrification were the extremely scattered clients who remain to be served and the preponderance of tenants, rather than owners, among those now unserved. The lack of capital among prospective users was pointed out as prohibiting the purchase of converting devices and therefore limiting the sale of power.

Experiments on electric house heating were discussed by Homer J. Dana, assistant director of engineering, Experiment Station, Washington State College. Experiments are being carried out at the State College and at Mason City on direct resistance heating in insulated and non-insulated homes and off-peak storage heating using rock as the storage agent. Results of these experiments are not yet ready for publication but it is expected that the college will release them some time during the summer. A number of other reports were devoted to the possible field for the power to be produced at Bonneville and Grand Coulee in industry but no positive or conclusive findings resulted from the work of the various committees.

Local Group Takes Over Texas Resettlement Project

Transfer of Beauxart Gardens, a 50-family resettlement project near Beaumont, Tex., to a local corporation for maintenance purposes, has been concluded by the Resettlement Administration. This is the second resettlement project that has been transferred to a local corporation, the first being the Houston Gardens project near Houston, Tex.

Under the new arrangement, residents of the community will organize a corporation which will buy the buildings for $153,000, payable over a 40-year period with interest at 3 per cent. The average cost of the homes is $3,058, and with the other necessary charges such as taxes, maintenance and insurance, the total monthly charge per family will be only $23.08. Each home unit includes 3½ acres of land with a house and a combination garage, cow shed and tool house, and a chicken house. Each home is also provided with a well and an electric pump and a pressure tank as well as a septic tank sewer system. The garden plots help the settler to supplement his regular income.

Little Rock to Acquire New Water Supply

The new water supply system for Little Rock, Ark., to be constructed now that the city has acquired the local distribution system (*ENR*, Feb. 27, 1936, p. 333), will include an impounding dam on Alum Creek and a gravity-flow conduit to the existing filter plant on the Arkansas River. The dam will be of earth, 110 ft. high, and will have a length of 2,800 ft. The conduit will be 39 in. in diameter and 32 miles long, with a rated capacity of 22 m.g.d. It is expected that bids for construction of the dam will be received about April 1. Burns & McDonnell, Kansas City, Mo., are engineers for the project.

Excessive hardness of the Arkansas River supply during low water in the summers of 1933 and 1934 led to a report by a committee, headed by M. Z. Bair, chief engineer of the Arkansas Board of Health, advising a supply from Alum Creek. A project in line with the report was approved by the PWA, and Burns & McDonnell were engaged as engineers. A subsequent ruling by the PWA that the city must buy or build a distribution system caused delay (*ENR*, Dec. 5 and 26, 1935, pp. 794, 899). Finally a price of $3,850,000 for the existing works was agreed upon by the city and the water company. Bancamerica-Blair Corp., and Stranahan, Harris & Co. have agreed to take $4,090,000 of city bonds to cover the purchase price. The PWA has approved the transaction and authorized a loan and grant of $3,080,000 for construction of the new supply works at a cost of $7,170,000.

In contrast with the 200-400 p.p.m. hardness of the Arkansas River supply, the Alum Creek supply has a hardness of 15 p.p.m. and a low turbidity.

Suit Over Water Diversion Dismissed by Supreme Court

The U. S. Supreme Court, on March 1, dismissed a suit brought by the state of Washington against the state of Oregon to stop the diversion of water from the Walla Walla River for irrigation in Oregon to the alleged detriment of inhabitants of Washington. The case centered around the diversion of water from the Walla Walla River by temporary dams close to Red Bridge, diversion which according to a report to the court by William W. Ray, special master, had been going on for more than 50 years before the filing of this suit. Washington claimed that this resulted in a deficiency in the supply for the Gardena Farms District.

Stripped of details, the court found that: "To restrain the diversion at the bridge would bring distress and even ruin to a long established settlement of tillers of the soil for no other or better purpose than to vindicate a barren right." This conclusion was based on a finding that while a Washington court in 1892 had adjudged the Gardena district the holder of water rights with an 1892 priority it was not until 1904, long after the Oregon irrigators began their diversion, that the water was put to beneficial use by the district and then only in trifling quantities. The court held further that were the diversions to be stopped, the water would be lost in the porous bed of the river below the point of diversion.

Minnesota Societies Hold Annual Meeting

The Minnesota Federation of Architectural and Engineering Societies held its annual convention in Minneapolis on Feb. 21-22, with about 300 in attendance. Among the papers presented was "The Minneapolis-St. Paul Sewage Project," by C. C. Wilbur, chief engineer, and "Latest Developments in Air Conditioning," by Elliott Harrington, chief engineer, air conditioning department, General Electric Co. The federation approved the recommendations of the board of directors and joined the American Engineering Council. A committee was appointed to write a proposed amendment for the simplification of the state registration law. The following officers were elected: E. D. Corwin, president; G. H. Butler, W. H. Wheeler, O. F. Moore, vice-presidents, and J. R. Johnston, treasurer.

The Minnesota Surveyors and Engineers' Society met in Minneapolis just prior to the federation's meeting and elected C. L. Methven president; H. E. Chard, vice-president, and I. E. Odendahl, secretary-treasurer.

New York Plan Group to Study Soil Conservation

The New York State Planning Council, created last year upon recommendation of Governor Lehman, and continued for 1936, held a meeting in Albany, Feb. 20, for the purpose of considering such subjects as soil conservation, flood control and pollution in connection with its 1936 program of study. For several months last year following the disastrous floods of July an intensive study of flood control was carried on under direction of Capt. Lester F. Rhodes, engineer in charge of the U. S. Army Flood Control Survey for southern New York and northern Pennsylvania. The field work of the survey embraced study of approximately fifty possible dam sites which may be used in connection with an extensive flood control development. Completion of the report under Captain Rhodes is expected to be made in the near future and transmitted to Congress together with recommendations.

F. B. Howe, of the soil conservation service, U. S. Department of Agriculture, at the Albany meeting of the New York State Planning Council, reported that flood control must start with the small tributary streams which are dry a majority of the time. Mr. Howe was named as head of a committee created at the Albany meeting to act as technical advisors to the State Planning Council in coordinating soil conservation and flood control activities. It has been suggested that soil conservation and flood control be also studied in connection with the matter of pollution in the Mohawk Valley and other sections. Such a study, if decided upon by the council, would require months of additional study and would be carried on in cooperation with several state departments, chiefly those of health and conservation.

SOCIETY CALENDAR

AMERICAN RAILWAY ENGINEERING ASSOCIATION, annual meeting, Chicago, Ill., March 10-12.

AMERICAN WATER WORKS ASSOCIATION, annual meeting, Los Angeles, Calif., June 8-12.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting, Atlantic City, N. J., June 29 to July 3.

IOWA ENGINEERING SOCIETY, annual meeting, Marshalltown, March 11-12.

NEW JERSEY SEWAGE WORKS ASSOCIATION, annual meeting, Trenton, March 19-20.

KENTUCKY-TENNESSEE SECTION, AMERICAN WATER WORKS ASSOCIATION, Lexington, Ky., March 23-25.

NEW YORK SECTION AMERICAN WATER WORKS ASSOCIATION, Oswego, N. Y., March 26-27.

FLORIDA SECTION, AMERICAN WATER WORKS ASSOCIATION, annual meeting, Tampa, March 31-April 1.

INDIANA SECTION, AMERICAN WATER WORKS ASSOCIATION, annual convention, Lafayette, Ind., April 7-9.

Canadian Relief Camps To Be Abolished

The relief camps which were organized by the federal government of Canada for unemployed single men, are to be abolished by the new administration. The present allowance to men in the camps is to be increased to $15 a month. This monthly allowance will be paid out half in cash, the remaining half being set aside until the man leaves to seek employment.

As one means of promoting further employment, the government has arranged with Canadian National Railways and the Canadian Pacific Railway through the Minister of Railways and Canals to have 10,000 men engaged on deferred maintenance work on the trackage of these two companies during the coming summer. This work is expected to start as soon as the spring break-up occurs.

Personals

ALBERT T. PERKINS, formerly general manager for the United Ry. Co., and consulting engineer, St. Louis, Mo., has been elected chairman of the board of trustees of the Governmental Research Institute for 1936. The institute until recently was known as the Bureau of Municipal Research.

MERRILL BERNARD, formerly of Gregory & Bernard, consulting engineers, New Orleans, La., is now hydraulic engineer in watershed and hydrologic studies, Soil Conservation Service, Washington, D. C.

GEORGE W. TRAYER, senior engineer, Forest Products Laboratory, Madison, Wis., has been appointed to the newly established position of chief of the division of forest products in the U. S. Forest Service with offices in Washington, D. C. Mr. Trayer was graduated in civil engineering from the University of Wisconsin in 1912 and has been engaged in timber mechanics and research at the laboratory since that time.

FRANK B. CAMPBELL, recently engaged on the construction of the Sutherland Dam of the Platte Valley Public Power and Irrigation District in Nebraska, is now associate soil conservationist with the Soil Conservation Service at Statesville, N. C.

STEPHEN W. SMITH, chief engineer examiner for the PWA in Massachusetts and at one time acting state director, has been appointed project engineer for the Loup River federal power district, Columbus, Neb. Mr. Smith was engaged on various water-power projects in northern New England from 1913 to 1923 and for the ten years following was employed by the Stone & Webster Engineering Corp., Boston, on hydro-electric development work, notably on the Rock Island project on the Columbia River.

JOHN T. RAWLINGS, former Campbell County, Ky., engineer, has been appointed city manager for Newport, Ky., to succeed CLYDE E. WALLINGFORD, who has resigned.

A. O. WEST, civil engineer, Batavia, N. Y., has been appointed engineer in charge of WPA projects in Genessee, Orleans and Wyoming counties.

VIRGIL L. PETERSON, lieutenant colonel, Corps of Engineers, has been appointed District Engineer at Detroit.

C. W. DREPPERD, formerly director of the Creative Division of the Federal Housing Administration, has resigned that position to take up new duties as sales promotion director of the Pierce-Arrow Motor Corp., Buffalo, N. Y.

Obituary

TRACY S. BRINDLE, Ashland, Ohio, state director of public works for Ohio, died there Feb. 15. He was 52 years of age. Before his appointment as state director of public works in 1932, Mr. Brindle served as state highway engineer in Division 3, from 1923 to 1928. He was graduated from Ohio State University in 1906.

J. R. STEERS, president of the J. Rich Steers, Inc., contracting engineers, New York City, died on February 12. He was 55 years old. Mr. Steers was graduated from the Columbia University School of

Mines in 1890 and shortly after his graduation organized the firm of which he was president. Mr. Steers' organization had built a number of the Hudson River piers on both the New York and New Jersey shores. Mr. Steers was also treasurer of Henry Steers, Inc., a sand and gravel company.

ORA HEMPHILL, 47, construction engineer for the Arkansas state highway department and former chief engineer, died at his home in Little Rock, Ark., Feb. 29, following a long illness. He first became connected with the highway department in 1921, becoming state highway engineer in 1927, resigning a few months later to reenter private construction work. A few years later he returned to the state highway department as construction engineer.

RICHARD JOHNSON, for many years a contractor in Boston, Mass., and member of the firm of Johnson Brothers, died on Feb. 26. He was born in Dedham, Mass., 79 years ago, and built the seawall drives at Newport, R. I., the first sewerage system at Nahant, Mass., and many important buildings in New England.

HENRY W. GODDARD, vice-president and director of the Blagden Construction Corp. of New York, died March 1 of pneumonia. He was 54 years old. Graduating from Massachusetts Institute of Technology in 1904, he entered upon a career of construction engineering, specializing in the building of fine residences. He served during the World War as a major.

GUSTAVE FUCHS, 79 years old, the last survivor of the engineering corps that constructed the Eads Bridge across the Mississippi River between St. Louis, Mo., and East St. Louis, Ill., more than 61 years ago, died suddenly of a heart attack at his home in Belleville, Ill., on Feb. 21.

CONSTRUCTION STATISTICS FOR THE WEEK

ENGINEERING construction volume for the week totals $33,824,000, of which private is $11,392,000 and public $22,432,000, with federal $1,408,000 and state and municipal $21,024,000. This represents a gain in private awards and a drop in public work compared with a week ago. Corresponding volume a year ago is: total, $22,799,000; private, $7,640,000; public, $15,159,000, of which federal was $3,643,000 and state and municipal, $11,516,000.

Industrial building awards show a large gain for the week compared with last week and a good gain over last year. They total $6,724,000 for the week. Highway awards were the lowest for the year, $4,837,000. Other classes of work are: commercial buildings, $2,360,000; public buildings, $7,265,000; bridges, $2,267,000; waterworks, $1,983,000; sewerage, $2,369,000; earthwork, waterways and drainage, $866,000.

The larger awards for the week include: plant for Crown Cork and Seal Co., Philadelphia, Pa., $500,000; new construction and improvements during 1936, including substations, generating plants, transmission lines, etc., company forces, Northern States Power Co., Minnesota and North Dakota, $3,365,000; refinery for Pure Oil Co., Toledo, Ohio, $750,000; power plant for Union Pacific Coal Co., Rock Springs, Wyo., $500,000; Public School 113, Bronx, N. Y., $1,026,000; electric work and lighting fixtures for buildings at Brooklyn College, Brooklyn, N. Y., $503,000; armory building, Schenectady, N. Y., $510,000; bridges by Illinois highway department, $649,000; end ramp paving, Queens approach, Triborough Bridge, Contract 50, New York, N. Y., $426,000; paving Wards and Randalls Island, Contract 61, $571,000; waterworks improvements, Covington, Ky., $681,000; Manhattan intercepting sewers and sewage flow regulation, New York, N. Y., $965,000; Mill Creek Sewer, Louisville, Ky., $650,000; rehabilitating twelve parks, East St. Louis Park District, relief labor, East St. Louis, Ill., $856,000; pier shed on Pier 90, New York, N. Y., $599,000; car track renewals, replacements and track changes, day labor, Capitol Transit Co., Washington, D. C., $1,567,000.

A large volume of state and municipal bond sales, the largest this year, distinguishes this week's new capital report, $27,877,000. This week also brings the recording of the Jones & Laughlin Steel Corp. registration of the largest bond issue for new construction purposes since the establishment of the Securities and Exchange Commission, $31,500,000 for new construction and plant equipment. With these two additions, private investment financing of construction takes a 152 per cent lead over a year ago.

CONTRACTS
(Thousands of Dollars)

	Weekly Average Mar. 1935	Prev. 4 Weeks	Week Mar. 5 1936
Federal Government	$3,373	$2,468	$1,408
State and municipal	13,845	28,087	21,024
Total public	$17,218	$30,555	$22,432
Total private	5,521	10,570	11,392
Week's total	$22,739	$41,125	$33,824
Cumulative to date: 1935...$239,152,000		1936...$486,870,000	

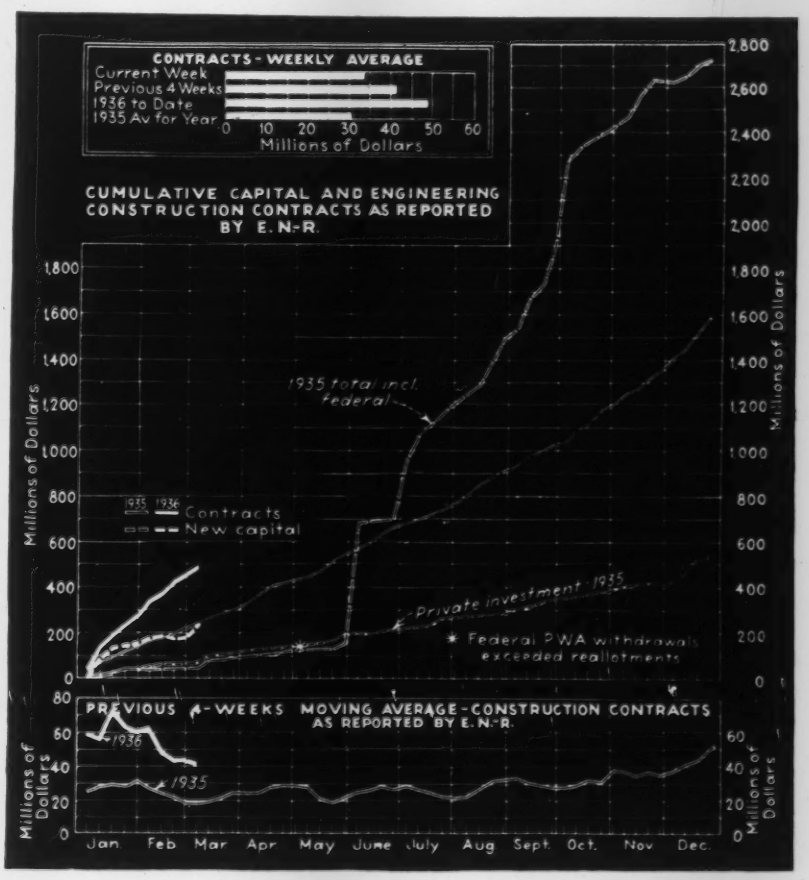
NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

1936	Week Mar. 5	Cumulative
State and municipal	$27,877	$115,312
PWA non-federal	—423	28,449
RFC loans	.....	25,000
Corporate issues	31,950	61,341
PWA loans	30	1,270
Total Non-Federal	$59,434	$231,372
Federal	.....	4,271
Total new capital	$59,434	$235,643
Cumulative to date: 1935...$44,718,000		1936...$235,643,000

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for federal construction, deficiency act funds. An arbitrary percentage (25%) of the WPA allotments and local contributions to WPA work is included to allow for the capital additions through the Works Progress Administration division of the new program.

INDEX NUMBER

ENR Cost	1913 = 100	1926 = 100	ENR Volume	1913 = 100	1926 = 100
Mar., 1936	**201.20**	**96.71**	**Feb., 1936**	**176**	**77**
Feb., 1936	201.20	96.71	Jan., 1936	248	109
Mar., 1935	194.26	93.38	Feb., 1935	76	33
1935 (Av.)	195.22	93.84	1935 (Av.)	135	58
1934 (Av.)	198.10	95.23	1934 (Av.)	114	50
1933 (Av.)	170.18	81.80	1933 (Av.)	102	47


CONTRACTS - WEEKLY AVERAGE
Current Week
Previous 4 Weeks
1936 to Date
1935 Av for Year
0 10 20 30 40 50 60
Millions of Dollars
CUMULATIVE CAPITAL AND ENGINEERING CONSTRUCTION CONTRACTS AS REPORTED BY E.N-R.
1935 total incl. federal
1935 1936 Contracts
New capital
Private investment 1935
* Federal PWA withdrawals exceeded reallotments
Millions of Dollars
PREVIOUS 4-WEEKS MOVING AVERAGE - CONSTRUCTION CONTRACTS AS REPORTED BY E.N-R.
1936
1935
Jan. Feb Mar Apr May June July Aug Sept. Oct. Nov Dec.

BUSINESS SIDE OF CONSTRUCTION

February Gains Over Last Year Public and Private Work Higher

ENGINEERING CONSTRUCTION awards total $164,499,000, a drop below the two high months which preceded, but a gain of 142 per cent over February last year. This brings the gain for the two months up to 109 per cent over last year. The total for February is made up of private, $42,278,000; public, $122,221,000, of which federal is $9,872,000. Comparable figures a year ago are: total, $68,089,000; private, $20,485,000; public, $47,604,000, of which federal is $8,965,000. The gain over a year ago is in the private and state and municipal classifications, 106 per cent and 191 per cent respectively; federal, 10 per cent.

While the largest gain is in public buildings, industrial building awards continue to increase in volume and commercial buildings awards are higher. Bridges and streets and roads show a substantial increase as do also waterworks and sewerage.

Geographically all territories except the South show broad gain with New England, Middle Atlantic and Middle West showing the best improvement over last year. The Middle Atlantic territory shows a higher average weekly volume in February than in January of this year.

New capital

State and municipal bond sales maintained their average at more than $8,000,000 per week and in addition absorbed the $5,740,000 block of PWA bonds sold by the RFC. Corporate issues sales for the month total approximately $12,500,000. PWA allotments outstanding decreased due principally to the canceling of the Port of New York Authority loan which will be replaced by private investment financing, and other reductions and changes in outstanding allotments. Private investment financing for the first two months of this year gained 106 per cent over the corresponding period last year.

Materials

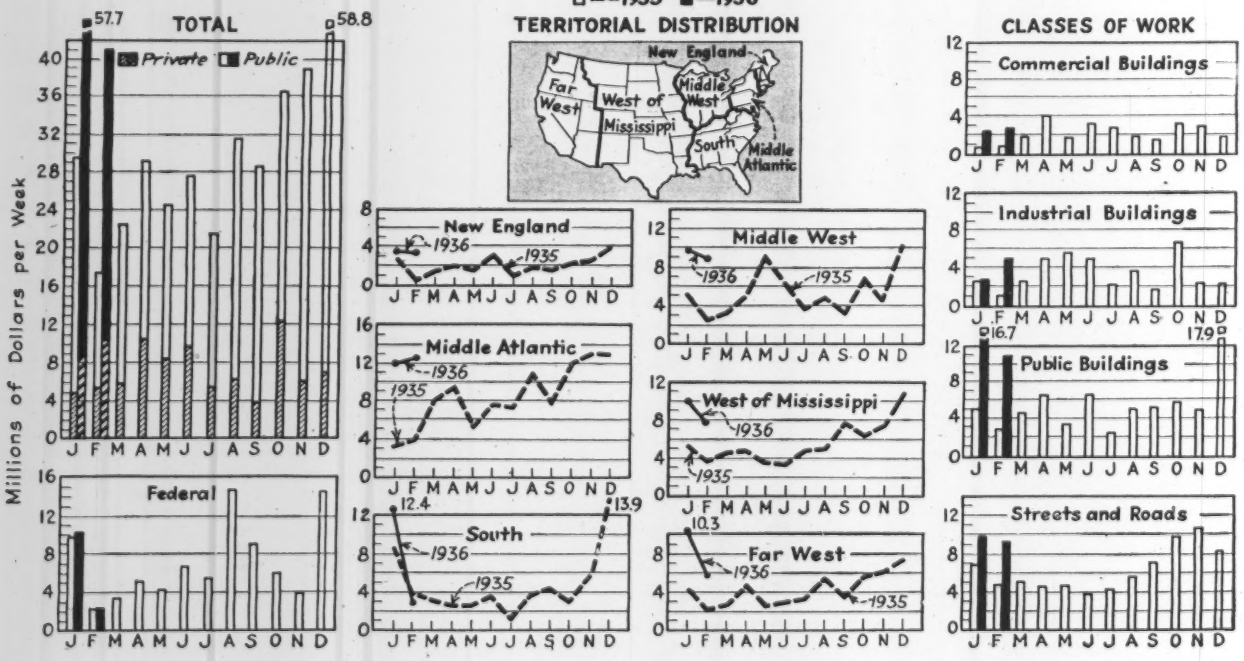
Cement—Portland cement shipments in January totalled 3,889,000 bbl., an increase of 36.6 per cent compared with January, 1935, as reported by the U. S. Bureau of Mines. Stocks at mills were 4 per cent

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN FEBRUARY, 1936

Four Weeks—Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States February 1936	United States Two Months 1936	United States Two Months 1935	Canada Feb. 1936
Public Works										
Waterworks	275	770	966	3,247	2,279	4,608	12,145	30,086	13,123	
Sewerage	298	3,667	251	5,878	1,519	1,555	13,168	36,559	10,364	23
Bridges, public	414	3,506	2,066	1,632	2,807	790	11,215	31,048	12,469	125
Earthwork and waterways	503	420	90	.....	2,447	422	3,882	48,367	42,874	108
Streets and roads	1,532	4,414	4,204	6,668	9,836	2,669	29,323	78,866	52,490	...
Buildings, public	5,011	17,144	1,591	4,771	8,495	6,669	43,681	123,713	37,253	23
Unclassified, public	4,258	1,949	448	455	465	1,232	8,807	19,043	3,816	57
Total public	12,291	31,870	9,616	22,651	27,848	17,945	122,221	367,682	172,389	336
Federal gov't (included in above classifications)	678	4,402	889	290	3,432	181	9,872	71,930	57,701	...
Private										
Bridges, private	.....	462	.....	.....	.....	.....	462	1,420	3,436	...
Buildings, industrial	610	4,024	972	9,872	516	4,099	20,093	33,124	15,809	...
Buildings, commercial	340	7,935	.....	250	1,223	1,155	10,903	22,572	7,384	2,880
Unclassified, private	.....	5,935	797	2,293	1,637	158	10,820	28,248	17,335	...
Total private	950	18,356	1,769	12,415	3,376	5,412	42,278	85,364	43,964	2,880
February, 1936 (4 weeks)	**13,241**	**50,226**	**11,385**	**35,066**	**31,224**	**23,357**	**164,499**	.....	.....	**3,216**
January, 1936 (5 weeks)	16,748	59,816	62,154	48,334	50,082	51,413	288,547	.....	.....	12,103
February, 1935 (4 weeks)	2,304	16,048	15,586	9,007	15,302	9,842	68,089	.....	.....	5,049
Two months, 1936	29,989	110,042	73,539	83,400	81,306	74,770	.....	453,046	.....	15,319
Two months, 1935	14,610	33,849	58,222	35,373	42,897	31,402	.....	.....	216,353	9,080

ENGINEERING CONSTRUCTION REPORTED BY E.N.-R. WEEKLY AVERAGES

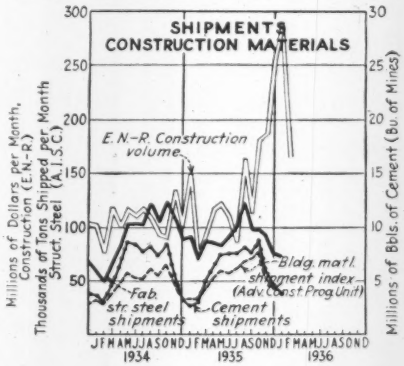


higher than a year ago and production was up 13.4 per cent. The ratio of production to capacity in January was 16.1 compared with 14.1 a year ago and 25.6 in December.

Steel—The operating rate of steel companies, having 98.0 per cent of the steel capacity and reporting to American Iron and Steel Institute, ranged from 50 to 52.9 in February, compared with 47.9 to 52.8 a year ago. The average for the month was 51.7 compared with a corresponding average of 50.1 last year.

Fabricated structural steel production during January as reported by the American Institute of Steel Construction was 34 per cent of normal (normal being considered as the annual average of shipped tonnages as published by U. S. Department of Commerce, for the years 1928-31). Shipments were 31.5 per cent, but bookings for the month showed an increase to 50.1 per cent.

Bookings during the last quarter of 1935 were 41.4 per cent of normal, 36.9 per cent during the third quarter and 37 per cent


SHIPMENTS
CONSTRUCTION MATERIALS
E.N.-R. Construction volume
Bldg. mat'l. shipment index (Adv. Const. Prog. Unit)
Fab. str. steel shipments
Cement shipments
Millions of Dollars per Month, Construction (E.N.-R.)
Thousands of Tons Shipped per Month Struct. Steel (A.I.S.C.)
Millions of Bbls. of Cement (Bu of Mines)
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1934
1935
1936

during the first half. Estimated shipments for the entire industry totals 73,710 tons for January, 1936.

Lumber—Lumber shipments reported by the National Lumber Manufacturers Association increased 12 and 8 per cent respectively the first two weeks of February, declined 18 per cent the third week and gained back 12 per cent the fourth week. Shipments were reported the heaviest in three months. The industry reports that production was 51 per cent of the 1929 weekly average of production during the week ended February 15 and 59 per cent of shipments.

Lumber prices reported were generally stable during the last half of 1935 but began to stiffen in January, 1936, particularly in the South and this movement continued and broadened in February.

The *Index of Shipments of Construction Materials* for January is 48 compared with 44 in December, 54 in November and 34 in January a year ago as reported by Advance Construction Programs Unit, Spacel Control.

Building permits

Building permits issued in 215 cities reporting to Dun & Bradstreet, Inc., amounted to $54,938,059 during January compared with $62,992,039 in December, a decrease of 12.8 per cent compared with the usual seasonal decline of 12 per cent. Permits granted in New York City were valued at $14,105,246 compared with $5,806,663 a year ago. For the 214 cities outside of New York City the total was $40,832,813 compared with $21,019,605 a year ago.

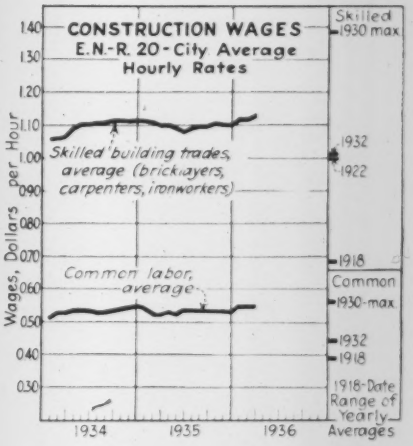
Final returns for 1935 on building permits reported to the Bureau of Labor Statistics, U. S. Department of Labor, show that compared with 1934 the value of residential buildings for which permits were issued in the 811 cities covered, increased 170 per cent. Dwelling units were provided in these cities for 76,515 families compared with 29,668 families for which new dwelling units were provided in 1934.

The value of factory and workshop buildings for which permits were issued in 1935 was 78 per cent greater than in 1934. These figures indicate the same trend reported earlier by *Engineering News-Record* statistics which showed a 65 per cent increase in industrial buildings put under construction in 1935. The *News-Record* industrial building trend is based on a larger volume of construction which includes buildings outside cities.

The number of new buildings involved is: new residential 53,058 in 1935 compared with 21,773 in 1934; new non-residential, 79,439 compared with 64,546 in 1934; and additions, alterations and repairs, 317,626 compared with 264,341 in 1934. The respective values are: $291,227,231 for new residential in 1935 compared with $107,146,264 in 1934; new non-residential, $316,730,227 compared with $215,402,856 in 1934; and additions, alterations and repairs, $228,546,659 compared with $168,505,689 in 1934. Dwelling units in 1935 were made up of: 1-family houses, 49,001; 2-family houses, 2,428; and multi-family units, 1,523; total for this analysis, 52,952. Corresponding figures for 1934 are: 1-family, 20,198; 2-family, 1,176; multi-family, 341.

Labor

Employment in the Production of Six Major Construction Materials is reported to be 43.9 for January compared with 46.0 in December and 38.0 in January last year, according to the index computed by Advance Construction Program Unit, Space



Control, Procurement Division, U. S. Treasury.

Reduced employment on private building construction is reported by the Bureau of Labor Statistics, U. S. Dept. of Labor, due to the winter weather conditions. Reports from 8,007 contractors showed 59,953 workers on their rolls in January, a decline of 13 per cent from December in employment and 14 per cent in payrolls. This refers to employees engaged in erecting, altering and repairing private buildings and does not include projects financed by PWA, RFC or other public funds.

A gain of more than 500,000 in the number of persons employed on the program financed by the Emergency Relief Act of 1935 is reported for the month ending January 15. Of these 250,000 are working on the federal program, and 2,750,000 on WPA projects.

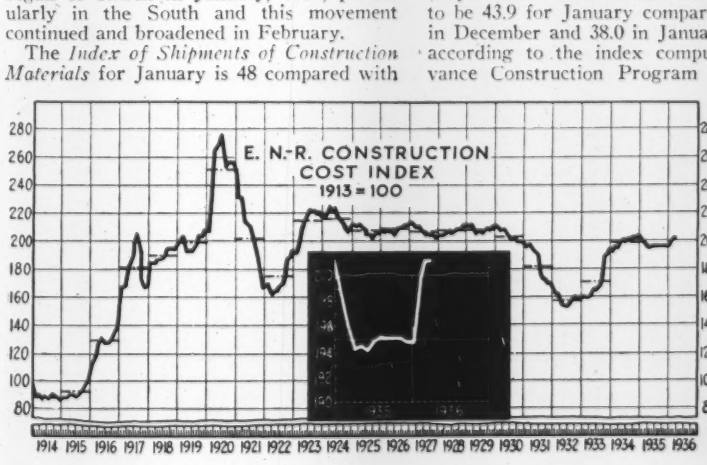
During January 200,000 persons were employed on PWA construction projects, a decrease of 35,000 compared with December.

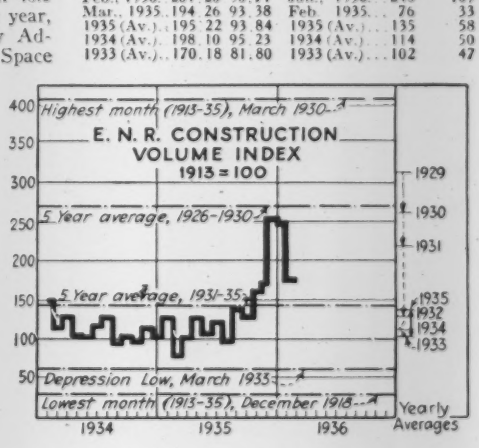
ENR Cost and Volume Index

THE *Engineering News-Record* Construction Cost Index remains at 201.20 for March.

The *ENR* Volume Index is 176 for January.

	▲ INDEX NUMBER				
ENR Cost	1913 = 100	1926 = 100	ENR Volume	1913 = 100	1926 = 100
Mar., 1936	201.20	96.71	Feb., 1936	176	77
Feb., 1936	201.20	96.71	Jan., 1936	248	109
Mar., 1935	194.26	93.38	Feb., 1935	76	33
1935 (Av.)	195.22	93.84	1935 (Av.)	135	58
1934 (Av.)	198.10	95.23	1934 (Av.)	114	50
1933 (Av.)	170.18	81.80	1933 (Av.)	102	47





CURRENT PRICES OF CONSTRUCTION MATERIALS

CEMENT, AGGREGATES AND READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT (Per bbl., carload lots, including 40c. per bbl. for bags, cash discount not included)			SAND AND GRAVEL (Per ton, carload lots)			CRUSHED STONE (Per ton, carload lots)		CRUSHED SLAG (Per ton, carload lots, f.o.b. plant)		CONCRETE Ready Mixed 1:2:4, 50c.y. or more, delivered
	Cloth Bags*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	¾ in.	½ in.	1½ in.	¾ in.	
Atlanta	$3.02	$2.79	$2.50	$2.31	$2.31	$1.64	$1.69	$1.92	$1.80	$1.80	$8.50
Baltimore	2.65	2.40	2.15	1.80‡	1.80‡	1.30‡	1.80‡	1.80‡	1.80	1.80	7.25
Birmingham	2.40	2.15	1.95	1.80	1.80	1.45	1.00	1.00	.90	1.15	5.45
Boston	2.42	2.17	1.92	1.40	1.40	.90	1.40	1.40	.....	.....	6.50
Chicago	2.60	2.35	2.20	1.50	1.50	1.44	1.80	1.80	1.10	1.10	.....
Cincinnati	2.50	2.25	2.05	1.20	1.20	1.30	1.80	1.80	.....	.....	6.70
Cleveland	2.41	2.16	.....	1.40	1.40	1.30	1.60	1.60	1.75	1.75	7.15z
Dallas	2.45	2.20	2.00	1.55	1.55	1.30	2.00	2.05	.....	.....	7.00c
Denver	3.09	2.84	.....	1.20	1.40	.90	.....	.....	.....	.....	.....
Detroit	2.26	2.01	1.85	1.35	1.35	1.20	1.40	1.60	1.55‡	1.65‡	6.75
Kansas City	2.51	2.26	2.06	.....	1.85	1.25	1.85	1.80	.....	.....	7.65
Los Angeles	2.25	2.05	.....	1.40	1.40	1.00	1.40	1.40	.....	.....	6.31
Minneapolis	2.90	.....	2.45	1.00p	1.00p	.25p	1.00p	1.00p	.....	.....	7.00d
Montreal	.....	1.70	.....	.85	.90	1.25	.85p	1.20p	.....	.....	4.50t
New Orleans	2.47	2.22	2.00	1.75	1.75	1.45	.....	.....	.....	.....	8.15
New York	2.60‡	2.35‡	.....	1.40†k	1.40†k	.75†k	1.75†k	1.85†k	.....	.....	8.00
Philadelphia	2.63	2.38	2.18	1.35‡	1.45‡	1.05‡	2.60‡	2.75‡	1.00‡	1.00‡	7.75
Pittsburgh	2.46	2.21	1.61	1.50‡	1.50‡	1.70‡	2.25‡	2.25‡	1.50	1.50	7.00
St. Louis	2.53	2.28	.....	1.40‡	1.40‡	1.40‡	.75p	.75p	.65/.95§	.50/.95§	6.80
San Francisco	2.72	2.52	2.20	1.35	1.35	1.35	1.50	1.50	.....	.....	7.53
Seattle	2.95	2.70	.....	1.00	1.00	1.00	1.44	1.44	.....	.....	6.75

*10c. allowed for each returnable bag. †Per cu. yd. ‡Delivered. §F.o.b. Granite City, Ill. kBarge lots alongside dock. pf.o.b. plant. z5 tons or more. cWithin 3-mi. from Pub. Square. dton. d 25c. discount for cash.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Alpena, Mich.	$1.50	$1.45	Ironton, Ohio	$1.50	$1.45	North Birmingham, Ala.	$1.75	$1.70
Buffington, Ind.	1.70	1.65	Iola, Kans.	1.70	1.65	Richard City, Tenn.	1.85	1.80
Crestmore, Calif.	1.72	.....	La Salle, Ill.	1.70	1.65	Saginaw, Mich.	1.50	1.45
Dallas, Tex. (Inc. 5c. tax)	1.80	1.75	Limedale, Ind.	1.70	1.65	Steelton, Minn.	1.80	1.75
Hannibal, Mo.	1.70	1.65	Mason City, Ia.	1.70	1.65	Universal, Pa.	1.65	1.60
Hudson, N. Y.	1.75	1.70	Norfolk, Va.	1.76	1.71	Waco, Tex. (Inc. 5c. Tax)	1.80	1.75
Independence, Kans.	1.70	1.65	Northampton, Pa.	1.65	1.60	Wyandotte, Mich.	1.45	1.40

Cash Discounts, Cement, to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount, 10c. per bbl. for payment within 15 days of date of invoice.

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE—PARTITION—SCORED (Per M, lots of 2,000 pieces or over, 3x12x12 in.)	(4x12x12 in.)	(8x12x12 in.)	STRUCTURAL CLAY TILE—LOAD BEARING—SCORED (Per M, lots of 2,000 pieces or over, 8x12x12 in.)	(10x12x12 in.)	(12x12x12 in.)	BRICK (Per M, in quantity, Common backing)	(Straight hard)	LIME (Per ton, Hydrated finishing)	(in paper, Common hydrated)	(carload lot, Pulverized or lump)
Atlanta	$75.80	$80.80	$151.60	$181.90	$212.20	$242.50	$14.25	$14.25	$24.00	$17.00	$15.90
Baltimore	91.00	98.00	183.00	219.00	315.00	390.00	13.00	17.00	16.00	12.50	18.50
Birmingham	78.75	84.00	157.50	189.00	201.25	242.00	15.00	19.00	2.50§	1.50§	2.00§*
Boston	84.40,t	90.00,t	168.75,t	191.25,t	246.75,t	282.00,	14.50	18.00	20.00	15.50	3.50d
Chicago	66.00	70.40	132.00	174.30	214.40	245.00	10.20	11.20	18.00	13.40	14.00
Cincinnati	55.00	58.70	110.00	124.10	164.20	187.70	17.50	17.50	15.97	12.48	.....
Cleveland	45.00	48.00	90.00	108.00	138.50	158.50	15.00	15.00	16.00k	14.00k	2.65kp
Dallas	72.00	75.00	149.00	177.00	217.00	269.00	13.50	26.00	19.00	16.00	1.55p
Denver	78.50	88.00	141.50	166.50	196.00	225.00	10.50	15.00	30.00	22.00	22.50
Detroit	71.85	76.65	143.70	230.00	280.00	325.00	12.50	13.50	14.25	11.90	22.20
Kansas City	72.50	75.50	92.00*	140.50	177.75	207.25	15.00	24.00	18.00	11.89	14.20*
Los Angeles	77.50	94.25	134.00*	188.00	232.50	311.50	11.50	14.00	18.70	.....	19.70
Minneapolis	80.15s	85.50s	145.40s	167.75s	175.25s	243.70s	13.10	15.10x	25.50	21.00	23.00
Montreal	79.10s	90.40	169.50s	.....	212.40	136.60	29.75	31.00	15.00	10.00	7.00
New Orleans	61.50	65.10	123.20	157.00	195.00	.....	13.75	.....	16.75	13.00	.....
New York	84.00	90.00	135.00*	193.30†	238.80†	295.60†	10.00	.....	20.00	15.50	20.00
Philadelphia	76.00	80.00	150.00	172.00	240.00	295.00	18.00	20.00	16.35	11.25	10.75
Pittsburgh	58.40c	62.30c	116.85c	165.00c	217.00c	250.00c	16.50	25.00	17.20	14.50	2.22p
St. Louis	62.00	65.00	120.00	180.00	234.00	280.00	15.00	18.00	22.00	16.00	2.25p
San Francisco	84.00	94.50	225.00	.....	.....	.....	15.00	18.00	22.11	21.50	2.05p
Seattle	84.00	95.50	180.00	198.00	.....	.....	15.50d	18.50	30.00	20.00	28.60p

*6x12x12 in. †F.o.b. Perth Amboy, N. J. ‡Per sack. §Per bbl., 200 lbs. pPer bbl. 180 lbs. qper bbl. 280-lb. kLCL. dless $1 cash 15 days. *lump. sSmooth. xSelected common. tCarload lots delivered to job.

ROAD SURFACING MATERIALS—F.O.B. CITY

	PAVING BRICK AND BLOCKS (Granite per M, lots of 50,000, 4x4x8 in.)	(Brick per M, 3x4x8¼ in., carload lots)	(Wood per sq. yd., 3½ in., 16-lb. treat.)	PAVING ASPHALT (Per ton, less than 80 penetration, Tank car)	(Drums)	ASPHALT BINDERS—FLUXES (Per gal., 80-300 penetration, Tank car)	(Drums)	CUTBACK ASPHALT (Per ton, Tank car)	(Drums)	ROAD OILS (Per gal., Tank car)	ASPHALT EMULSION (Per gal., Tank car)	(Drum)
Atlanta	$ 75.00	$35.00	$2.25	$18.20z	$23.41z	$0.728z	$0.999z	$19.20z	$27.22z	$0.668z	$0.085	$0.085
Baltimore	110.00	44.00	2.25	17.00	22.00	.075	.10	.09†	.125†	.....	.....	.....
Birmingham	110.00	25.00	.....	19.00	24.00	.0878	.1128	.10†	.137†	.....	.06	.....
Boston	75.00	28.00	2.75	17.00	22.00	.07	.095	.09†	.12†	.07	.095	.125
Chicago	125.00	42.00	2.60	16.00	20.00	15.00	19.00	.07	.11	.05	.....	.....
Cincinnati	115.00	37.00	.....	18.00	22.00	.09	.....	18.50	.....	.07	.08	.....
Cleveland	100.00‡	32.75	2.85	19.00	23.25	.075	.085	.075†	.0425†	.06	.085	.10
Dallas	.....	30.00	.....	16.50	21.00	.055	.14	17.50	25.00	.055	.1125	.1438
Detroit	.....	37.00	.....	19.67z	24.87z	.....	.....	17.00	22.50	.055	.11	.15
Kansas City	.....	45.00	.....	18.50	23.50	17.50#	22.50#	.077†	.107†	.057	.11	.15
Los Angeles	.....	50.00	.....	10.80	14.95	10.80#	14.95#	10.80	.....	.042	.06	.12
Minneapolis	.....	.....	2.50	18.20	24.70	.098	.098	21.85	34.65	.048	.....	.....
Montreal	70.00	60.00	3.62	14.00	19.66	.07	.093	19.00	26.50	.07	.135	.165
New Orleans	100.00	32.00	.....	15.00	18.75	.068	.095	.075†	.10†	.....	.0785	.11
New York	130.00§	65.00	2.64	17.00	22.00	.075	.10	.09†	.125†	.....	.075	.11
Philadelphia	110.00	45.00	2.25	13.50	18.00	.05	.08	.05†	.08†	.045	.08	.....
Pittsburgh	115.00	40.00	.....	19.00	24.00	.0775	.1125	.086†	.121†	.0675	.....	.....
St. Louis	40/115.00	35.00	.....	19.70	24.70	.09	.125	.85†	.12†	.0425	.09	.125
San Francisco	.....	50.00	.....	12.00	18.00	12.00#	18.00#	12.50#	23.00#	.04	.0575	.117
Seattle	.....	35.00	.....	25.50	25.50	17.00#	23.00#	15.00	.....	.03	.19	.20

Note: Paving asphalt, tank car or boat, f.o.b. Maurer, N. J., per ton, Bermudez, $25.00; Trinidad, $21.00. *Per sq. yd. †Per gallon. ‡4½x6x5½ in. #Per ton §4x5x9-in. Av. kMexican. zLocal reduction due to 20% reduction intra-state class freight rates, only Georgia affected.

CURRENT PRICES OF CONSTRUCTION MATERIALS

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet,	RIVETS ½-in. structural	WIRE NAILS Base	SHEET PILING Base	STEEL RAILS Per Gross Ton			TRACK SUPPLIES			
						Standard	Light	Re-rolled	Angle bars	Std. Tie spikes	Tie plates	Track bolts
Birmingham	$1.95	$2.10	$3.00	$2.55	.....	$36.375	$34.375	$35.00	$2.55	$2.60	$1.90	$3.60
Chicago	1.85	2.10	3.05	.....	$2.25	36.375	35.00	34.00	2.55	2.60	1.90	3.60
Pittsburgh	1.80	2.05	2.90	2.40	2.15	36.375	35.00	34.00	2.55	2.60	1.90	3.60

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

F.O.B. WAREHOUSE	STRUCTURAL SHAPES Per 100 lb., base price	REINFORCING BARS Per 100 lb., ¼ in., base price		EXPANDED METAL LATH —Per 100 sq.yd., carload lots—		WELDED FABRIC REINFORCING —Per 100 s.f., carload lots—			SHEET PILING Per 100 lb. base price
		New billet	Rail steel	Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in., No 6 & 6 wires Per sq.yd.	
Atlanta	$3.36	$2.34	$2.19	$21.00	$23.00	$1.53	$1.16	$0.1449	$2.70
Baltimore	3.00	2.75	2.60	25.00	28.00	1.41	1.08	.1332	2.45
Boston	3.54	2.923	1.925	20.00†	22.00†	1.46	1.12	.1449	2.60
Chicago	3.20	2.10	1.95	22.00	24.00	1.40	1.08	.1323	2.25
Cincinnati	3.40	3.25	3.25	25.01	29.50	1.59	1.07	.1287	.....
Cleveland	3.31	2.75	2.60	21.00	22.00	1.37	1.06	.1287	.....
Dallas	3.85	3.05	2.90	26.00	28.00	1.63	1.23	.1548	3.005
Denver	3.95	3.76	3.61	22.00	25.00	1.68	1.26	.1584	.....
Detroit	3.42	2.20	2.05	21.00†	22.00†	1.41	1.08	.1323	2.43
Kansas City	3.75	2.75	2.60	22.50	23.50	1.50	1.14	.1422	2.69
Los Angeles	3.00	2.525	.....	23.00	27.50	1.68	1.26	.1584	2.65
Minneapolis	3.45	2.86	2.71	22.00	26.00	1.51	1.15	.1431	2.57§
Montreal	3.15	2.40	2.30	32.00	33.00	2.30	1.71	.238	2.80
New Orleans	.....	.....	.....	19.00	23.00	1.54	1.17	.1458	.....
New York	3.37	2.50	2.35	19.50	21.50	1.44	1.11	.1359	2.50
Philadelphia	2.98	3.06	2.22	20.00	24.00	1.42	1.09	.1332	2.46
Pittsburgh	1.80‡	1.85‡	1.70‡	29.00‡	22.00‡	1.54	1.04	.1260	2.15
St. Louis	3.45	3.00	2.85	22.00	24.00	1.42	1.09	.1341	2.30
San Francisco	3.50	2.475	2.325	23.00	28.00	1.68	1.26	.1584	2.60
Seattle	3.55	2.50	.....	24.50	26.50	1.68	1.26	.1584	2.60

‡Base Mill Price. Note: Shapes, bars and piling subject to quantity discounts. §Mill Price plus freight to Minneapolis. †f.o.b. delivered.

PAINTING AND ROOFING SUPPLIES—F.O.B.

	RED LEAD Per 100 lb. in 500-lb. lots Dry	WHITE LEAD Per 100 lb. in 500-lb. lots# in oil	READY-MIXED PAINT Per gal., drums			ROOFING SUPPLIES Carload lots, f.o.b. factory				
			Graphite*	Aluminum†	Ferric Oxide‡	Rolls, slate surfaced, 85-90 lb., per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating, per gal.	Tar pitch, 350-lb. bbl., per ton
Atlanta	$7.75	$10.50	$1.60	$3.10	.....	$1.775	$1.85	$1.85	$.36	$25.40
Baltimore	7.00	10.00	1.40	2.25	$1.90	2.35	2.55	2.55	.48	25.00
Birmingham	7.25	10.50	2.35	2.35	1.85	1.68	1.63	1.69	.36	21.88
Boston	7.00	10.00	1.80	2.65	.05v	1.80	3.25	3.25	.42	22.00
Chicago	7.00	10.00	1.35	2.45	1.30	1.55	2.50	2.50	.38	22.00
Cincinnati	7.00	10.00	1.45	2.50	1.40	2.40	2.39K	2.39K	.36	21.00
Cleveland	7.00	10.00	1.65	2.30	1.40	1.60	1.79	1.79K	.24	20.00
Dallas	7.25	11.00	1.80	2.10	.....	2.05K	3.80	3.80	.14	35.00
Denver	7.50	10.75	2.55	.....	.....	2.25	3.55	3.55	.35	30.60
Detroit	7.00	10.00	1.65	2.30	1.40	2.55	2.80	2.55	.35	30.00
Kansas City	7.00	10.12½	1.25	2.65	1.00	2.05	3.10–3.20	3.10–3.20	.23	24.50
Los Angeles	7.25	10.25	1.60	2.25	2.30	2.00	1.50	.....	.45	.....
Minneapolis	7.00	10.12½	.....	.....	.....	1.78v	1.52Kv	1.52Kv	.29	23.30
Montreal	.....	8.20	1.85	3.50	1.85	1.90	2.44	1.88	1.55§	1.52§
New York	7.00	10.00	1.75	2.35	1.40	1.68	1.45K	1.45K	.232	22.00
Philadelphia	7.00	10.00	2.50	2.95	1.50	1.68	1.85K	1.48K	.37	22.00
Pittsburgh	7.00	10.00	1.05	1.95	.80	1.75	1.65K	1.65	.38	25.00
St. Louis	10.00	10.00	1.85	2.45	1.30	1.78K	2.525	2.525	.25	25.00
San Francisco	7.25	10.25	1.80	2.75	1.10–2.00	1.89	3.10	3.10	.38	26.00
Seattle	7.25	10.25	1.80	2.85	2.20	3.30	2.66	2.69	.69	30.00

*U. S. War Dept. Spec. 3-49A. †ASTM Spec. D266-31. ‡80% maximum ferric oxide. §Per 100 lb. KPer roll, 65 lb. xPer lb. v Minneapolis & vicinity.
Note: Red lead in oil 5½c higher than white lead in oil. #Basis of quoting changed this month from list to 500-lb. lots.

MISCELLANEOUS ITEMS

	WINDOW GLASS Discounts from latest jobbers List, Sept. 15, 1928 Single or Double Thickness		EXPLOSIVES Per lb. dynamite delivered 50-lb. cases Gelatin	
	A quality	B quality	40%	60%
Atlanta	85%	85%	$0.155	$0.17
Baltimore	88%	90%	.16	.175
Birmingham	88%	90%	.105	.120
Boston	88–10–5%	90–10–5%	.16	.18
Chicago	87%	89%	.155	.17
Cincinnati	89–10%	91–10%	.27	.29
Cleveland	85–10%	85–10%	.20	.215
Dallas	87%	89%	.1675	.1825
Denver	86%	88%	.155	.17
Detroit	87–10%	89–10%	.225	.240
Kansas City	86–10%	88–10%	.16	.175
Los Angeles	90%*	90–40%	.1725†	.1925†
Minneapolis	86%	88%	.175	.19
Montreal	60–30%	70–5%	.1875	.2125
New Orleans	88%	90%	.19	.22
New York	88%	90%	.225	.24
Philadelphia	88%	90%	.1550	.17
Pittsburgh	88%	88%	.11	.1250
St. Louis	89%	89%	.11	.125
San Francisco	82%	87%	.1575	.1775
Seattle	90–10%	90–20%	.1425	.1575

*Disc. from list Aug. 1, 1929. †F.o.b. Arsenal. ‡Double thickness A & B.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York.	
Bleaching powder, in drums, F.o.b. works, per 100 lb.	$2.00@$2.10
Calcium chloride, 77-80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, f.o.b. works, freight equalized with points of competition, per ton	22.00@35.00
Chlorine cylinders, per lb. delivered	.055.06
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb.	1.35
Soda ash, 58%, in paper bags, per 100 lb	1.25
Sulphate of aluminum, commercial, in 100 lb. bags per ton	27.00
Sulphate of copper, in bbl., per 100 lb.	3.85

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf Barge	Short Leaf Rail	Long Leaf Barge	Long Leaf Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.12	$0.165	$0.13	$0.16
12 in.—2 ft. from butt.	6 in.	50 to 59 ft.	.16	.21	.15	.20
12 in.—2 ft. from butt.	6 in.	60 to 69 ft.	.17	.225	.16	.21½
14 in.—2 ft. from butt.	6 in.	50 to 69 ft.	.195	.235	.20½	.24½
14 in.—2 ft. from butt.	6 in.	70 to 79 ft.	.2125	.245	.24½	.30½
14 in.—2 ft. from butt.	5 in.	80 to 85 ft.	.275	.385	.....	.....
14 in.—2 ft. from butt.	5 in.	85 to 89 ft.	.315	.452	.....	.....

RAILWAY TIES

Prices f.o.b., per tie, for carload lots:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
Boston	Oak, untreated	$1.25	$1.80
	Pine, untreated	1.35	1.85
	Pine, creosoted	1.75	2.45
New York	Long-leaf sap pine, untreated	.80	1.00
	Mixed oak, untreated	.....	1.00
	White oak, untreated	.75	1.50
	White oak, creosoted	no market	
Birmingham	Southern pine, untreated *6x8x8'6'	.45*	.60
	Southern pine, creosoted	1.00*	1.20
Chicago	White oak, untreated	1.15	1.40
	Oak, empty cell, creosoted	1.50	1.88
	Oak, zinc treated	1.40	1.70
	Southern pine, creosoted	1.35	1.78
Los Angeles	Fir, untreated	.50	.72
	Fir, creosoted	1.67	2.40
Philadelphia	Red oak, untreated	1.00	.....
	Red oak, creosoted	.....	2.10
	White oak, untreated	1.13	1.45
St. Louis	Red oak, untreated	1.10	1.40
	Red oak, creosoted	1.50	1.95
	Sap Pine or cypress, untreated	.95	1.30
San Francisco	Douglas fir, green, untreated	.45	.63
	Douglas fir, empty cell, creosoted	1.14	1.56
Montreal	Birch or maple, untreated	1.00	1.10
	Birch or maple, creosoted	1.25	1.55

CURRENT PRICES OF CONSTRUCTION MATERIALS

WATER, SEWER AND DRAIN PIPE

	C. I. PIPE	VITRIFIED SEWER PIPE				CLAY DRAIN TILE		CONCRETE SEWER PIPE		WROUGHT STEEL PIPE			
	Per net ton, f.o.b. 6 in. to 24 in.*	Per foot, delivered, standard (‡ f.o.b.) 8 in., s.s.	12 in., s.s.	24 in., d.s.	36 in., d.s.	Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	Per ft., delivered; ASTM C 14-24 12 in.	24 in.	Full standard weight. # 1 to 3 in., Butt Weld Black	Galv	3½ to 6 in., Lap W Black	Galv
Atlanta	$43.00	$0.225d	$0.405d	$1.4625	$4.50	$80.00	$128.00	$0.50	$1.625	44%	37%	42%	34%
Baltimore	46.50	.25	.50	2.10	5.75	108.00	168.50	.75	1.75				
Birmingham	39.00	.25	.45	1.625	4.66	85.00	220.00	.45	1.60	64%	55%	65%	56%
Boston	46.50	.21	.405	1.89	5.6375	99.00	153.00	.40	2.25				
Chicago	47.50	.28	.54	2.025	4.615	80.00	132.00	.36	1.42	53%	42%	54%	43%
Cincinnati	46.00	.189	.3645	1.62	5.535	69.00	108.00	.40	1.40	53.04%	42.02%	54.265%	43.24%
Cleveland	47.50	.168	.324	1.44	4.6125	42.50	88.50	.35	1.74	58.4%	48.4%	60.6%	49%
Dallas	51.00	.35	.67	2.70	.....	165.00	260.00	.46	1.57	64%	55%	64%	5[illegible]
Denver	59.00	.27‡	.47‡	1.98‡	.....	105.00	180.00	.....	.....	56%	45%	43%[k]	57%
Detroit	47.50	.189	.3645	1.62	5.74	82.00	136.00	.35	1.20	49%	38%	50%	3[illegible]
Kansas City	49.00	.30	.54	2.16	4.90	120.00	140.00	.40	1.50	49%	38%	50%	3[illegible]
Los Angeles	47.50	.2825‡	.508‡	2.03‡	5.535‡	115.50	192.50	1.00	2.00	53.57%	43%	53%	42.5[illegible]
Minneapolis	49.50	.255	.459	1.836	4.67	.....	.....	.50	1.34				
Montreal	50.00	.33‡	.59‡	2.04‡	.....	82.00	134.00	.53	1.50				
New Orleans	45.00	.32	.51	1.65	.....	67.00	.....	.45	2.00				
New York	46.00	.25	.55	2.00	6.25			.55	2.00	51.88%[e]	40.86%[e]	53.10%[e]	42.08%[e]
Philadelphia	43.00	.336	.648	2.835	8.68	175.00	210.00	.54	1.80	52.37%[e]	41.35%[e]	53.39%[e]	42.57%[e]
Pittsburgh	49.00	.182‡	.351‡	1.62‡	4.92‡	69.00	108.00	.75c	1.75	64%	55%	65%	56%
St. Louis	46.00	.255	.459	1.836	3.96	85.00	170.00	.80	2.00	51.266%	40.245%	52.49%	41.47%
San Francisco	47.00	.265	.477	1.908	5.22	103.50	172.50	.45	2.20	52.4%	63.4%	51.1%	64.6%
Seattle	48.50	.4225	.63†	3.06†	7.55†	85.00	200.00†	.50†	1.80	65.80%	57.25%	66.75%	56.30%

*b. & s. class B and heavier, C/L lots, 200 tons and over. Burlington, N. J. (base) $43.00. Gas pipe and class A, $3 per ton additional. 4-in., $3 per ton additional. 30 in. and larger usually $1. per ton less.

#Discounts from standard list for delivery from warehouse, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¼ in., 8½c; ⅜ in. 11½c.; 1 in. 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92.

†Less 30% in C/L Lots. c Concrete Culvert pipe reinforced. dDouble strength. ‡Sales & municipal taxes extra

[k] 2½ to 3 in. [e] Resale price to consumer, car load lots shipped from mill.

LUMBER AND TIMBER—PER M FT. B.M., CARLOAD LOTS F.O.B.

		SHORT LEAF YELLOW PINE AND DOUGLAS FIR								LONG LEAF Y. P.	
		All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. All Fir planks No. 2 common; Fir timber is No. 1 common. Lengths up to 20 ft.								Merchantable grade up to 20 ft.	
		1x6,[s]	1x8,[s]	2x4,[s]	2x6,[s]	2x8,[s]	2x10,[s]	3x12,[R]	6x12,[R]	12x12,[R]	2x12,[R]	12x12,[R]
Atlanta	Southern Pine	$17.50	$17.50	$19.50	$19.50	$19.50	$21.50	$25.00	.....	.....	$38.50	$40.00
Baltimore	Southern Pine	23.50	24.50	27.50	26.50	27.00	29.00	37.50			55.00	58.00
	Douglas Fir	29.50	29.50	28.50	28.50	28.50	29.50	30.50	$32.50	$31.00	.....	.....
Birmingham	Southern Pine	21.00	21.00	19.00	18.00	20.00	20.00	29.00	28.00	28.00		
	Long Leaf	22.00	22.00	22.50	21.50	22.50	25.50	43.00	.....	.....	45.00	42.00
Boston	Southern Pine	28.00	28.00	33.00†	33.00†	47.00†	55.00†	70.00†	.....	.....	70.00	53.00
	Douglas Fir	28.00	28.00	33.00	33.00	35.00	35.00	40.00	40.00	40.00		
Chicago	Southern Pine	29.50	29.50	33.50	32.50	32.50	35.50	45.50	.....	.....	54.50	54.50
	Douglas Fir	34.50	35.50	39.50	37.50	38.50	39.50	41.50	41.50	41.50	.....	.....
Cincinnati	Southern Pine	23.00	25.00	26.00	25.00	25.50	26.50	40.00			31.50	.....
	Douglas Fir	.....	.....	.....	.....	.....	.....	43.50	46.25	46.25	.....	.....
Cleveland	Southern Pine	28.00	30.00	36.00	30.00	34.00	36.00	47.00	45.00	.....	50.00	62.00§
Dallas	Southern Pine	d28.35	30.60	31.50	29.80	30.15	30.15	50.40	.....	.....	42.75	67.95
Denver	Douglas Fir	43.00	40.00*m	43.00*	43.00*	43.00*	49.00*	52.00*	56.00*	61.50	.....	.....
Detroit	Southern Pine	24.00	24.00	25.00	24.50	24.50	25.50	35.00			29.00	41.50
	Douglas Fir	.....	.....	.....	.....	.....	.....	41.50	41.50	41.50	.....	.....
Kansas City	Southern Pine	23.50	24.00	23.50	23.00	23.50	24.50	34.00			53.00	60.00
	Douglas Fir	27.50	28.50	29.00	27.50	27.50	30.00	33.00	35.00	35.00	.....	.....
Los Angeles	Douglas Fir	31.00,[y]	31.00,[y]	31.00,[y]	31.00,[y]	31.00,[y]	31.00,[y]	38.00,[y]	48.00[y]	41.00[y]	58.00*[h]	.....
Minneapolis[c]	Western Pine	45.00*	51.50*	50.00*	41.00*	41.00*	42.00*	59.50*[h]	.....	.....	.....	.....
	Douglas Fir	39.00*	42.00*	43.50*	41.00*	41.00*	42.00*	59.50*	59.50*	59.50*	.....	.....
[h]Montreal	Spruce	28.00	29.00	25.00	27.00	30.50	33.00	36.00	.....	.....	.....	.....
	Douglas Fir	47.50	53.00	42.50	44.00	44.00	45.75	51.00	51.00	51.00	43.00	.....
New Orleans	Southern Pine	23.50	25.50	28.00	25.00	27.00	25.50	38.00	.....	.....	44.00	54.00
	Douglas Fir	28.50	30.00	33.00	29.00	32.00	33.50	37.00	.....	.....	.....	.....
New York	Southern Pine	33.00*	34.00*	33.00*	34.00*	34.00*	38.00*	45.00*			70.00*	70.00*
	Douglas Fir	.....	.....	37.00*	37.00*	35.00*	38.00*	40.00*	43.00*	43.00*	.....	.....
Philadelphia	Southern Pine	30.00	31.00	32.00	32.00	33.00	34.00	36.00	.....	.....	36.00	42.00
	Douglas Fir	45.00	45.00	45.00	45.00	45.00	45.00	45.00	42.00	42.00	.....	.....
Pittsburgh	Southern Pine	30.50	31.90	37.65	33.75	36.52	37.50	47.75			57.50	57.50
	Douglas Fir	38.52	39.70	39.70	38.55	39.10	39.38	53.25	53.25	53.25	.....	.....
St. Louis	Southern Pine	30.00*x	31.00*x	31.00*x	29.50*x	30.50*x	31.00*x	47.00*x			72.00	70.00
	Douglas Fir	.....	.....	.....	.....	.....	.....	.....	55.00*x	55.00*x	.....	.....
San Francisco	Douglas Fir	20.00[t]	20.00[t]	21.50[t]	21.50[t]	22.00[t]	22.50[t]	24.50	25.00[t]	25.00	.....	.....
Seattle	Douglas Fir	14.00	15.00	15.00	14.00	14.00	14.00	20.00	19.00	19.00	.....	.....

*Delivered. †Spruce. ‡Long-leafed Y. P. §Norway Pine. [h]Northern Pine. mNative. tAt ship's tackle. yYard prices. d10% Disc. taken off. x5M ft. or less s4S. RRgh. cContractors in Minneapolis and St. Paul get 15% disc. from list.

CURRENT BUILDING AND CONSTRUCTION WAGE RATES PER HOUR

	Bricklayers	Carpenters	Structural Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$0.70/1.125	$0.40/.90	$0.60/1.25	$0.75/1.50	$0.60/1.00	$0.30/.40	$0.30/.40
Baltimore	1.25	1.10	1.37½	1.25	1.25	.45	.45
Birmingham	1.00	.60/1.00	1.00	1.125	1.00	.30/.40†	.30/.40†
Boston	1.30	.70/1.175	1.20	.90/1.175	1.375	.50/.70	.50/.70
Cincinnati	.80/1.375	.65/1.20	1.25	1.00/1.25	.80/1.375	.45	.45
Chicago	1.50	1.50	1.50	1.50	1.50	.95	.95
Cleveland	1.375	1.12½	1.25	1.25	1.375	.72	.72
Dallas	.50/1.00	.50/1.00	.50/1.00	.50/1.00	.50/1.00	.25/.40	.25/.40
Denver	1.10	1.10	1.10	.....	.....	.50	.50
Detroit	1.25	1.00	1.25	.75/.95	1.25	.55/.75	.55/.75
Kansas City	1.325	1.125	1.25	1.125	1.325	.70	.45/.50
Los Angeles	1.10	1.10	1.125	1.125	1.25	.50	.60
Minneapolis	1.00	.70/.85	1.00	.85	1.00	.40	.45/.50
New Orleans	1.00	.75	1.00	1.00	1.25	.30/.40	.30/.40
New York	1.50	1.40	1.475/1.65	1.50/1.5625	1.50	.82½	.50/.80
Philadelphia	35/1.50	.65/1.10	.70/1.375	.90/1.00	1.10/1.37	35/50	.40/.50
Pittsburgh	1.00/1.50	1.00/1.25	1.00/1.375	1.00	1.00/1.50	.70	.50
St. Louis	1.50	1.25	1.47	1.35/1.47	1.50	.78½	.35/.78½
San Francisco	1.50*	1.125	1.37½	1.12½	1.25*	.62½	.60
Seattle	1.00	1.00	1.25	1.25	1.25	.60	.60
Montreal	.70	.60	.80	.55	.70	.35	.40

Skilled Avg: (Bricklayers, Carpenters, Ironworkers) $1.132 Common Avg. $0.547 *6-hr. Day. † PWA.

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

★ **Ala., Birmingham**—City retained Sanborn & Bogart, consult. engrs., 30 Church St., New York, to prepare plans industrial water system. Total est. $5,808,000. Test borings awarded to Kirkpatrick Drilling Co., 1313 Fifth Ave. S. Noted Jan. 21, C. D.—Jan. 23, E. N.-R.

★ **Calif., San Francisco** — Public Utilities Comn., City Hall, takes bids upon completion of plans concrete work and roofing for University Mound Reservoir, est. $587,000; excavation and concrete for Sunset Reservoir, $650,000; Crystal Springs Pipe Line No. 2, from Crystal Springs Dam to Burlingame, $580,000; constructing discharge pipe line from Sunset Reservoir, $250,000; pumping station at Irvington, $50,000. N. A. Eckart, 425 Mason St., engr.

Idaho, Dayton—City, election Mar. 14, to vote bonds for constructing water system extension, $25,000.

N. Y., Apalachin—Town of Owego withdrew bids to have been opened Mar. 3, pending outcome of water test borings, for water supply system, $42,000. P.W.A. project. Nussbaumer & Clarke, Security Mutual Bldg., Binghamton, engrs. Noted Feb. 19, C. D.—Feb. 27, E. N.-R.

N. Y., Bath—Village will not take bids Mar. 14, constructing standpipe, pumps, equipment, etc., $132,000. P.W.A. project. W. T. Field Eng. Co., Flower Bldg., Watertown engrs. Noted Feb. 25, C. D.—Feb. 27, E. N.-R.

Wash., Seattle—H. D. Fowler, water supt., asks City Council for authority to issue $200,000 in short-term water bonds to assist suburban water districts, which will become the city's customers in development work and to build new 16 in. main in East Marginal Way. T. R. Beeman, County-City Bldg., engr.

Wis., Little Chute—See "Contracts Awarded."

Ont., Queenston—Town making plans waterworks reservoir and 2 mi. 6 in. mains. R. B. Erwin, 449 Queen St., Niagara Falls, engr. Interested in prices of all materials.

BIDS ASKED

★ **Colo., Denver** — Mar. 17, by Bd. Water Comrs., City and County Bldg., furnishing slow mixing and accessory equipment for use in the West Side filter plant; constructing filter plant building complete, rein.-con. wash tank, cistern and accessory work; furnishing, installing chemical feed equipment, sluice gates, valves, filter controllers, wash water venturi meter, cast iron pipe lines within filter plant building, pressure water supply system and miscellaneous piping, gages, laboratory equipment; furnishing five pumping units and appurtenances. Est. $1,000,000. P.W.A. project. E. H. Schneider, City and County Bldg., Denver, design engr. Alvord Burdick & Howson, 20 North Wacker Dr., Chicago, Ill., engrs.

Conn., Greenwich—See "Contracts Awarded."

Conn., Norwalk—See "Contracts Awarded."

†**Ill., North Chicago**—Mar. 24, by Vet. Bu., Arlington Bldg., Wash., D. C., water softening system at U. S. Veterans Facilities.

Ind., Michigan City—Mar. 16, by City, constructing watermains in Lake Shore Dr., 5,210 lin.ft. 6 and 8 in. c.i. pipe; 22,000 sq.ft. 6 in. concrete walk. Div. H. P.W.A. project. Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs.

N. Y., Amsterdam—See "Contracts Awarded."

N. Y., Coney Island (Sta. Brooklyn)—Mar. 23, by Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, installing general, electrical and lighting equipment for fire pumping station, Neptune Ave. and West 23rd St., Brooklyn Boro.

N. Y., Hornell—See "Contracts Awarded."

N. Y., West Seneca—See "Contracts Awarded."

N. C., Mount Pleasant—Mar. 12, by Mayor and Bd. Town Comrs., constructing 1 deep well. P.W.A. project. G. C. White Co., Durham, engrs.

O., Nevada—Mar. 17, by City, pumping plant iron removal unit and waterworks system. Bids Dec. 10 rejected.

Tex., Bogota—Mar. 12, by City, c/o Dr. C. McCain, mayor, drilling, equipping water well. Est. $6,600. P.W.A. project. Municipal Eng. Co., Burt Bldg., Dallas, engrs.

Wash., Tacoma—Mar. 16, by Board Comrs. & Awards, 18,990 lin.ft. 48 in. pipe line, 2,750 ft. steel pipe and 16,240 either steel or lock joint steel cylinder rein.-con. W. A. Kunigk, Water Dpt., City Hall, engr.

CONTRACTS AWARDED

Ala., Birmingham—See "Proposed Work."

Calif., Santa Barbara—City Council, constructing works for Sheffield Filtration Plant, to Daley Corp., 4430 Boundary St., San Diego, $134,694. Est. $160,000. **P.W.A.** Bids Feb. 10, awarded Feb. 20. Noted Feb. 20, C. D.—Feb. 6, E. N.-R.

Conn., Greenwich — Greenwich Water Co., Greenwich, waterworks improvements, day labor and separate contracts. Est. $84,000. Noted Feb. 25, C. D.—Feb. 27, E. N.-R.

Conn., Norwalk — City, Brown and Scott Reservoir work, incl. repairing dam, fencing, property and cleaning, also watershed work. W.P.A. labor. Owner builds. $23,658. P. James, City Hall, engr.

Ill., Elgin—City, water treatment plant with auxiliary piping and appurtenances, to C. E. Giertz & Son, Elgin, $114,000. Bids Feb. 10. Noted Feb. 4, C. D.

Ill., Rock Island—City, M. T. Rudgren, city clk., improving waterworks system, to Greenleaf Constr. Co., Rock Island, $42,148. **P.W.A.** Bids Dec. 2. Noted Nov. 21, C. D.

Ill., Summit—Village, R. Lambert, pres., Sect. 2, waterworks, incl. cleaning 50,000 ft. watermains, to National Water Main Cleaning Co., 50 Church St., New York, at 14c. per ft. **P.W.A.** Bids Jan. 10. Noted Jan. 6, C. D.

★ **Ky., Covington**—City, 75,000 gal. steel tank on 100 ft. tower, to Chicago Bridge & Iron Wks., 654 Rockefeller Bldg., Cleveland, O., $7,965***improvements to distribution system, to J. G. Exterxamp, Covington, $54,324***traveling intake screen, to Chain Belt Co., 1600 West Bruce St., Milwaukee, Wis., $8,770***purification works, structures, to C. H. Tompkins Co., 1630 Connecticut Ave. N.W., Wash., D. C., $410,711***filter equipment and piping, to E. W. Bacharach & Co., 1200 Rialto Bldg., Kansas City, Mo., $194,700***furnishing, delivering pumps, to Dayton Dowd Co., Quincy, Ill., $5,018. Grand total $681,488. Bids Feb. 6. **P.W.A.** Noted Jan. 3, C. D.—Jan. 9, E. N.-R.

N. Y., Amsterdam—City, improving water supply, incl. removing trees and underbrush from watershed at Glen Wild, clearing underbrush from pipe line right-of-way from reservoir to Amsterdam (16 mi.), relief labor, $45,000. **W.P.A.** J. E. Carroll, Old Post Office Bldg., Albany, procurement officer W.P.A., will purchase materials.

N. Y., Hornell—City, repairing flood damage to No. 1 Reservoir, incl. earth fill dam, concrete corewall, spillway and retaining walls, relief labor, $128,091. **W.P.A.** funds allotted. J. E. Williamson, Federal Bldg., Elmira, Procurement Officer W.P.A., will purchase materials.

N. Y., Long Island City—Water Supply, Gas & Electricity, Municipal Bldg., New York, furnishing, laying steel and c.i. watermains in Astoria and Ditmars Blvd., to P. Tomasetti Contg. Co., 1074 60th St., Brooklyn, $279,000. Bids Feb. 3. Noted Feb. 4, C. D.—Jan. 30, E. N.-R.

N. Y., West Seneca—Town, constructing 6 in. c.i. watermains, valves, hydrants, etc., in Louis, Evelyn, Rose, Florence, Westminster and Center Sts., day labor. **W.P.A.** $33,917.

O., Cincinnati — City, waterworks improvements, Contr. C-3, elevated tank, to Chicago Bridge Iron Wks., Rockefeller Bldg., Cleveland, $6,560. **P.W.A.**

S. D., Sanator—State Bd. Charities & Corrections, G. Crill, secy., State Capitol, Pierre, furnishing, installing chlorinator and auxiliary equipment at State Sanatorium, to Wallace & Tiernan Co., Inc., 11 Mill St., Belleville, N. J., $1,411. Bids Feb. 17.

Tex., Buffalo—City, waterworks system, distribution system, to Ricker Constr. Co., Houston, $18,497***well, to J. W. Jackson, Houston, $4,495***tank and tower, to Chicago Bridge & Iron Wks., Athletic Bldg., Dallas, $4,985. Grand total $27,977. Est. $30,000. **P.W.A.** Bids Feb. 11. Noted Feb. 21, C. D.—Jan. 30, E. N.-R.

Tex., Graford—City, c/o A. F. Jones, mayor, Mason Dam on Keeche Creek, meters, valves, pump and pump station, to Texas Automatic Sprinkler Co., 2330 Summers St., Dallas, $27,621. Est. $30,000. **P.W.A.** Bids Nov. 15. Noted Oct. 31, C. D.—Nov. 7, E. N.-R.

Tex., Roxton—Lamar Co., W. C. I. D. 1, c/o W. P. Clark, 75,000 gal. elevated tank, 75,000 gal. concrete reservoir, pump house, pumps, c.i. pipe distributing system, sewers, incl. sewage treatment tank with vitr. clay collecting system, to Uvalde Constr. Co., Santa Fe Bldg., Dallas, $50,653. **P.W.A.** Noted Jan. 13, C. D.—Sept. 5, E. N.-R.

Tex., Tyler—City, c/o A. H. Balch, mgr., constructing one 500,000 gal. elevated tank and one 50,000 gal. elevated tank, to Taylor Iron Wks., Macon, Ga., $35,572. Est. $39,000. **P.W.A.** Bids Dec. 12, awarded Feb. 24. Noted Nov. 12, C. D.—Nov. 14, E. N.-R.

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Projects $500,000 and over symbol ★
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E. N.-R. Engineering News-Record
Federal Government projects symbol †

◆

Wis., Campbellsport—Village, deep well pump and Horey centrifugal pump, to Fairbanks Morse Co., 900 South Wabash Ave., Chicago, Ill., $1,341 and $343 respectively***gas driven pump, to Yeomans Bros. Co., 1433 North Dearborn St., Chicago, Ill., $728. Grand total $2,412. Bids Feb. 10. Noted Jan. 27, C. D.

Wis., Little Chute—Outgamie Co., constructing 8 in. well, 300 ft. deep, to Fasbender Bros., Fond du Lac, $880. Bids Jan. 27. Returned unopened bids to have been opened Jan. 27 for pumps and pump house. Will readvertise.

†**T. H., Honolulu**—Con. Q.M., Construction Div., additional water facilities at Schofield Barracks, to E. E. Black, Ltd., Honolulu, $129,676.

Ont., London—Public Utilities Comn., E. V. Buchanan, genl. mgr., laying 6 and 10 in. watermain extensions $25,000, drilling 3 new wells $15,000, 30x40 ft., brick pump house and 1,200,000 Imp. gal. pump $25,000. Owner builds under supervision E. V. Buchanan, genl. mgr. Noted Dec. 27, C. D.—Jan. 2, E. N.-R.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Calif., San Gabriel—City, defeated $250,000 bonds for sewer improvements. Proposed P.W.A. project.

Mass., Somerville—City rejected bids Feb. 6, 18 and 20 in. clay sewer in Broadway, Cross and Pearl Sts. J. E. Mullaney, city engr. Noted Feb. 17, C. D.—Feb. 20, E. N.-R.

N. J., New Providence—City rejected bids Feb. 19, for Contrs. A, C, D, E, F, for sewerage system, Contr. B, from Suburban Eng. Co., 15 West 38th St., New York, $87,244, has been recommended for award. Noted Jan. 24, C. D.—Jan. 30, E. N.-R.

★ **New York**—Sanitary Sewer Comn, Westchester Co., County Bldg., White Plains, soon takes bids constructing Sect. C South Yonkers Trunk Sewer $250,000, $112,500 P.W.A. grant; Sects. J1 and G2, Mill Valley Sewer in Greenburgh, and Sect. D1, in Mount Pleasant $360,000, $162,000 P.W.A. grant; Sects. J and K of Blind Brook Sewerage System in Rye, N. Y. $208,350, $93,757 P.W.A. grant. Grand total $680,850.

★ **N. Y., Buffalo**—City plans constructing sewage disposal plant on 20 acre site, at Bird Island Pier, foot West Ferry St. Soon takes bids on Michigan Masten Sewers. Total $15,000,000. P.W.A. project. Greeley & Hansen, 6 North Michigan Ave., Chicago, Ill., engrs. Noted Jan. 20, C. D.—Jan. 23, E. N.-R., under "Contracts Awarded."

BIDS ASKED

Ill., Chicago—Mar. 12, by Sanitary Dist. of Chicago, furnishing, delivering, installing 4 steam generator units, Div. O; 4 vapor heat units of high temperature type, Div. W, for Southwest Sewage Treatment Works at Stickney, Cook Co.

Ill., East St. Louis—Apr. 1, by East Side Levee & Sanitary Dist., S. H. Kernan, pres., 628A Missouri Ave., 1,428 ft. 54 in. extra strength culvert pipe, 14,995 ft. 42- to 54-in. standard strength culvert pipe, 280 cu.yd. concrete in manholes, 34 manhole frames and covers in Lansdown Section, East St. Louis, Washington Park and Fairmount City, $291,-

†*Federal Government.*

For official proposal advertising see Searchlight Section

Constr. News page 153

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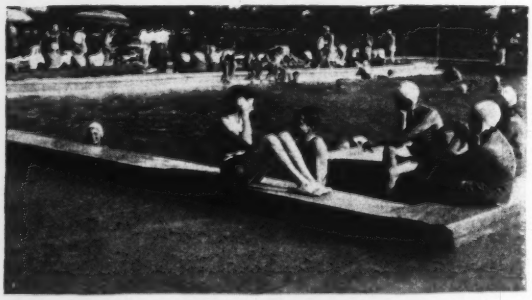

Pozzolith was used in the Oakwood Club Pool, Cleveland, to increase Density—check Disintegration. Geo. Mayer, Architect, Sam. W. Emerson Co., Contractors.

MASTER BUILDERS

Constr. News page 15

sewerage, etc. (Continued)

637. P.W.A. project. E. F. Harper, c/o owner, c/o engr. Horner & Shifrin, International Office Bldg., St. Louis, Mo., consult. engr. Noted Feb. 20. C. D.—Feb. 27. E. N.-R.

Md., Baltimore—Mar. 16, by Baltimore Co., 11,300 lin.ft. 6 and 8 in. terra cotta sewer pipe, manholes, etc., in Woodlawn, Rogers Forge and vicinity.

Md., Towson—Mar. 16, by Comrs. Baltimore Co., Court House, for excavation of trenches and furnishing, laying 11,300 lin.ft. 6 and 8 in. T.C. sewer pipe and appurtenances in certain streets and right-of-ways in Woodlawn and vicinity. Rogers Forge (Keelty Development).

Minn., St. Paul—Mar. 12, by Minneapolis-St. Paul Sanitary Dist., M. Rosen, secy., 1923 University Ave., constructing intercepting sewers and appurtenances from near Griggs-St. Anthony Ave. to near Victoria St.-St. Anthony Ave., Contr. 112, Div. F, Job 410, incl. 2,884 lin.ft. 11 ft. circular concrete section, Type A, in tunnel, 2 transition sections, 1,076 lin.ft. 11 ft. circular rein.-con. section, Type B, in tunnel. To exceed $100,000. C. C. Wilbur, c/o owner, ch. engr. Bids Feb. 24 withdrawn. Noted Feb. 6. C. D.—Feb. 13. E. N.-R.

N. Y., Auburn—See "Contracts Awarded."

N. Y., Cooperstown—See "Contracts Awarded."

N. Y., Eastchester—See "Contracts Awarded."

N. Y., Hamburg—See "Contracts Awarded."

N. Y., Lockport—See "Contracts Awarded."

N. Y., New York—Mar. 12, by J. J. Lyons, pres. Bronx Boro, Bronx County Bldg., sewers in DeReimer Ave., curbing, laying sidewalks, culverts, approaches and guard rails, etc., in Secor Ave.; constructing bridge East 161st St. and Eagle Ave.

N. Y., North Tonawanda—See "Contracts Awarded."

N. Y., Nyack—See "Contracts Awarded."

N. Y., Poughkeepsie — See "Contracts Awarded."

N. Y., Saratoga Springs—See "Contracts Awarded."

N. Y., Troy—See "Contracts Awarded."

N. C., Greensboro—Mar. 17, by City Council, A. Joyner, Jr., mgr., constructing sanitary sewer outfall, incl. 23,063 lin.ft. 10- to 48-in. pipe line, 2,820 lin.ft. 8- to 48-in. c.i. pipe line, 300 lin.ft. tunnel, 112 manholes, etc.

CONTRACTS AWARDED

Conn., Milford—Bd. Sewer Comrs., Town Hall, A. C. Smith, secy., Contr. 2, constructing pump house and boiler plant, to Loucks & Clarke Corp., 6 Ernest St., Wallingford, $26,984; Contr. 3, furnishing, installing equipment for treatment plant, to C. W. Blakeslee & Sons, 58 Waverly St., New Haven, $11,188. **P.W.A.** Bids Feb. 14. Noted Feb. 3, C. D.—Feb. 6, E. N.-R.

D. C., Wash.—District Comrs., District Bldg., constructing Luzon Valley Divorcement Sewer, to Ligon & Ligon, Inc., 3310 Ridge Ave., Baltimore, Md., $72,000; improving Wisconsin and Massachusetts Aves. to River Rd., to Highway Eng. Constr. Co., 7th and T Sts. N.W., $91,949.

Ill., Chicago—Underground Constr. Co., general contractors, 130 North Wells St., 625 tons reinforcing steel bars for Calumet Intercepting Sewer, for Sanitary Dist., to Concrete Steel Co., 3109 South Central Park Ave., Chicago, and 2 Park Ave., New York. Noted Jan. 8, C. D.—Jan. 16, E. N.-R.

★ **Ky., Louisville** — City, constructing Mill Creek Sewer, to Joseph and Robert Lombardi, Real Estate Trust Bldg., Phila., Pa., $650,084. Bids Feb. 11, awarded Feb. 26. Noted Jan. 14, C. D.—Jan. 16, E. N.-R.

N. Y., Auburn—City, constructing storm sewers in Cottage and Perrine Sts., relief labor. $27,000. **W.P.A.** Owner will purchase materials.

N. Y., Cooperstown—Village, constructing storm water sewer line in east side Susquehanna Ave., relief labor. $28,000. **W.P.A.** A. Calabriso, Telephone Bldg., Binghamton, procurement officer W.P.A., will purchase materials.

N. Y., Eastchester—Village, rein.-con. storm water drains in Hewitt Ave., Meredith Pl. and Northway, relief labor. $27,000. **W.P.A.** D. Jordon, High School, Main St., White Plains, Procurement Officer W.P.A., will purchase materials.

N. Y., Hamburg—Village, constructing 10 in. sanitary sewer in Mile Strip Rd. from Woodlawn School to sewage disposal plant, relief forces. $25,000. **W.P.A.** H. F. Burd, 1014 City Hall, Buffalo, Procurement Officer W.P.A., will purchase materials.

N. Y., Kingston—City, constructing sanitary sewers with laterals and manholes, in Kiedsted Ave., $28,000; 8 sanitary sewers in Spruce St., $5,000; sanitary sewers, laterals, manholes in Wrentham St., $25,000; 15 and 18 in. trunk line sewers in Roosevelt Park section, $30,000; 15 in. storm drains with catchbasins in O'Reilly St., $12,000, relief labor. **W.P.A.** Grand total $100,000. J. W. Carrol, Old Post Office Bldg., Albany, procurement officer W.P.A., will purchase materials.

N. Y., Lockport—City, constructing 12 in. sewer in Mill St. from Portage St. to Transit Rd.; 233 ft. sewers in Seymour Alley; 10 in. sewer in Central Alley from Pine to Cottage Sts.; relief sewer in Juniper St. from Harrison to Pound Sts.; and 15 in. sewer in Walnut St. from Washburn St. to Cave St. and Sunset Ave., relief labor. To exceed $25,000. **W.P.A.** E. Noonan, Bailey Bldg., Lockport, procurement officer W.P.A., will purchase materials.

★ **N. Y., New York**—Dpt. Sanitation, T. W. Hammond, comr., Municipal Bldg., constructing Manhattan Intercepting Sewers from West 164th to West 176th Sts., and sewage flow regulators and branch intercepting sewers, to Dimenna & Cleverock, Inc., 420 Lexington Ave., $91,326 and $874,164 respectively. Subject to P.W.A. approval. Bids Dec. 23. Noted Dec. 26, C. D.—Dec. 12. E. N.-R.

N. Y., North Tonawanda—City, constructing storm water sewers in North Ave., Locust, Iron, Stanley and Tremont Sts., relief labor. $35,000. **W.P.A.** E. Noonan, Bailey Bldg., Lockport, procurement officer W.P.A., will purchase materials.

N. Y., North Tonawanda — City, extending storm water sewer in Walck Rd. from New York Central R.R. tracks to Zimmerman St. and Erie Ave., relief labor. **W.P.A.** Est. about $23,000. E. Noonan, Bailey Bldg., Lockport, Procurement Officer W.P.A., will purchase materials.

N. Y., Nyack—City, storm water sewers with catchbasin in Franklin St., LaVeta Pl., Highland and 6th Aves., relief labor. $25,000. **W.P.A.** D. Jordan, High School, Main St., White Plains, procurement officer W.P.A., will purchase materials.

N. Y., Poughkeepsie—City, constructing sanitary sewers in Crossover St., North Randolph Ave., Wilson and Parkwood Blvd., relief labor. $30,000. **W.P.A.** D. Jordan, High School, Main St., White Plains, procurement officer W.P.A., will purchase material.

N. Y., Saratoga Springs—City, improving sewage disposal plants, incl. removing present fill underdrains and replacing with crushed stone; dynamite present beds to loosen sediment that has gathered through seepage and relaying drains, relief labor. $60,000. **W.P.A.** J. F. Leeds, South St. School, Glens Falls, procurement officer W.P.A., will purchase materials.

N. Y., Troy—City, constructing 850 ft. rein.-con. box type sewer in 15th Ward from 102nd to 103rd Sts., relief labor. $25,000-$28,000. **W.P.A.** J. W. Carroll, Old Post Office Bldg., Albany, Procurement Officer W.P.A., will purchase materials.

N. Y., Utica—See "Materials and Equipment under Proposed Work."

O., Chillicothe—City, contract for construction Sect. A-2, Contr. A, for sewer and sewage disposal plant awarded to C. J. Wetzel Co., has been cancelled by E. W. Barrett, special counsel for City. The Wetzel Co. has made no move to inaugurate operations, thus imperiling the receipt of federal aid. Est. $452,000. Noted Jan. 9, C. D.—Jan. 16, E. N.-R.

Tex., Austin—City, c/o J. G. Morgan, mgr., lateral sewer extensions and sewage lift stations, to Brown & Root, Inc., 706 Colorado St., Austin, $98,105. Est. $105,000. **P.W.A.** Noted Dec. 17, C. D.

Tex., Roxton—See "Waterworks."

Wis., Oconomoc—City rejected bids Feb. 8, constructing sewage treatment plant. Will probably build by W.P.A. labor. J. Donohue Eng. Co., Sheboygan, engr. Noted Feb. 17, C. D.—Feb. 20, E. N.-R.

Man., Winnipeg—City and Dominion Govt., 6 c.i. pipe river crossings at Ask St., Main St., Norwood Bridges, Point Douglas Ave., East Kildonan, to Nelson River Constr. Co. Ltd., Winnipeg, $69,462.

Ont., Ottawa—City applying to Legislature for authority to spend $350,000 for sewers for various streets. F. C. Askwith, City Hall, engr.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Iowa—State Hy. Comn., Ames, soon takes bids constructing one 526 ft. multiple span overhead crossing structure on Primary Rd. 3, over C.R. I & P Ry., east of Centerville, Appanoose Co., incl. 700 cu.yd. class 1 excav.

Iowa—State Hy. Comn., Ames, soon takes bids constructing 1 multiple span overhead crossing structure and 1 rein.-con. pipe culvert over over C.R.I. & P. Ry., on Primary Rd. 9, at west corporation line Rock Rapids Lyon Co., incl. 610 cu.yd. Class 1 and 2,200 cu.yd. channel excav.; 14 corrugated metal pipe culverts and extensions, 4 rein.-con. pipe culverts and 7 rein.-con. box culverts and extensions, on secondary road Montgomery Co., incl. 950 cu.yd. Class 1 excav.; 5 rein.-con. pipe and 5 rein.-con. box culverts, on relocation of P.R. 154, out of Arlington West, Fayette Co., 200 cu.yd. Class 1 excav.; 1 multiple span overhead crossing structure on secondary road, at C.R.I. & P. Ry., crossing west of Columbus Junction, Louisa Co., 385 cu.yd. Class 1 and 200 cu.yd. Class 2 excav.; 1 rein.-con. box, and 1 rein.-con. pipe culverts and 1 multiple span overhead crossing structure on secondary road Dubuque Co., incl. 310 cu.yd. Class 1 excav.; one 134x24 ft. con-

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†*Federal Government.*

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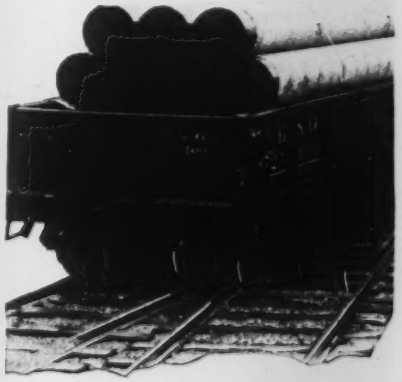

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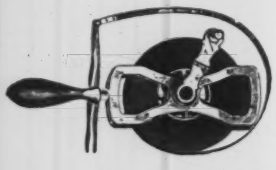

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Bridges, etc. (Continued)

tinuous I-beam overhead bridge on U.S. Rd. 6, at C. M. St. P. & P. R.R. west of Homestead, Iowa Co., 4,555 cu.yd. excav. F. R. White, ch. engr.

Missouri—See "Unclassified."

Missouri — State Hy. Comn., Jefferson City, plans constructing bridge over Chicago, Rock Island & Pacific R.R., on road from St. Joseph south Route 59, WPGH 49; one 100 ft. and three 55 ft. steel plate girders and two 50 ft. rein.-con. deck girder bridges over St. Louis, San Francisco R.R., on road from Joplin to Carthage, Route 66, WPGH 84, Jasper Co.; three 45 ft. concrete deck spans and 2 five ft. sidewalks over Chicago, Burlington & Quincy R.R., on Bissell Walker Rd., WPGH 784, St. Louis Co.; one 50 ft. and four 21 ft. I-beam spans, wrought iron, 2 track layout, 34 ft. roadway, concrete substructure over Chicago, Burlington & Quincy R.R., on road from Kansas City to Excelsior Springs, Route 10, WPGS 25, Clay Co.; one 45 ft. rein.-con. deck girder bridge over Atchison, Topeka & Santa Fe R.R., on road from Brunswick to Brookfield, Project WPGS 783, Chariton Co.; one 40 ft., two 35 ft. and three 31 ft. rein.-con. deck girder bridge over Chicago, Burlington & Quincy R.R., from St. Louis, Mo., to Alton, Ill., St. Louis Co. To exceed $138,000. T. H. Cutler, hy. engr.

★ **N. Y., Buffalo**—City, bids in spring, constructing high level bridge over Buffalo River, Erie St. and Fuhrman Blvd. approaches, etc., $2,032,000. Cost to be divided as follows: State Hy. Dpt. $500,000, Grade Crossing and Terminal Comn., Buffalo $283,000, W.P.A. $890,000, and city of Buffalo $350,000. Plans in progress under supervision G. J. Summers, Comr. P. Wks., City Hall. Noted Nov. 14, C. D. —Nov. 21, E. N.-R.

N. Y., Whitney Point—Dpt. P. Wks., State Office Bldg., Albany, bids in spring, constructing steel, concrete highway bridge on Hy. 902, near here, Broome Co. F. W. Donovan, 71 Frederick St., Binghamton, dist. engr.

North Carolina—State Hy. & P. Wks. Comn., Raleigh, rejected bids Feb. 18, bridge over Northeast Cape Fear River at Chimquapin, Project 2222, Duplin Co. To exceed $30,000. Will readvertise. Noted Feb. 5, C.D.-Feb. 13, E.N.-R.

★ **Pennsylvania and New Jersey** — Delaware River Joint Toll Bridge Comn., State House, Trenton, N. J., plans constructing 1,600 ft. bridge, 40 ft. over Delaware River from Phillipsburg, N. J., to Easton, Pa. $2,000,000 granted by P.W.A. Awaiting approval of Comn. L. Focht, State House, Trenton, N. J., engr. Noted June 3, C. D.—June 6, E. N.-R.

BIDS ASKED

Alabama—Mar. 12, by State Hy. Co., c/o G. Scott, pres., Montgomery, concrete, steel bridge and temporary surfacing on 2,899 mi. of Port of Birmingham-Ensley Rd., Jefferson Co., $207,000; concrete bridges on Collinsville-Ft., Payne Rd., De Kalb Co., $63,400.

Florida—Mar. 12, by State Road Dpt., Tallahassee, overhead grade crossing, at S.A.L.R.R., 0.567 mi. Rd. 8, W.P.G.H. 175-D, Polk Co.; bituminous on 6 in. Miami Oolite rock base surfacing 3.006 mi. County road known as Richard Rd., north of Florida City, W.P.S.O. 182-B, Dade Co.; 6 in. shell base pavement, two 15 ft. span treated timber bridge 5.311 mi. County Rd. 197, State Rd. 1, W.P.S.O. 183, Duval Co. C. B. Treadway, chn. J. H. Dowling, state hy. engr.

Missouri—Mar. 13, by State Hy. Comn., Jefferson City, constructing three 21 ft. I-beam spans over Mingo Branch, Route SF WPSO, Nodaway Co.; two 35 ft. I-beam spans over Mussel Forlk Creek, State Rd. from Route 5 to Route E, Chariton Co.; four 31 ft. rein.-con. deck girder spans over Middle Fobins River, Route 63, WPH 758, Schuyler Co.; one 50 ft., two 40 ft. and two 30 ft. rein.-con. deck girder spans over Chicago & Alton R.R., Route 22, WPGH 303G and one 150 ft. steel truss span over Chicago, Burlington & Quincy R.R., Route 54, Project WPGH 126B1, both Audrain Co.; rein.-con. arch bridge with rein.-con. wing walls over St. Johns Drainage Ditch on Route 69, Project 45A, state road from Kansas City, North, Clay Co.; steel deck plate bridge over Big Blue River, Missouri, Pacific, St. Louis & San Francisco R.R., and Chicago, Rock Island & Pacific R.R. and Kansas City & Southern R.R. tracks on 23rd St., WPMGM 737A, Kansas City, Jackson Co.; two 12 ft. rein.-con. slab spans over stream, Route 50, WPH 246D, road from Warrensburg to Kansas City, Johnson Co.; two 31 ft. I-beam spans, Route SE, Project WPSO 659A, state road, from Route 50 to Latham Rd., Moniteau Co.; three 8 ft. rein.-con. slab spans over Joachim Creek, Route SV, WPSO 767A, road from Route 61 to Valley Mines, Jefferson Co.; three 10 ft. rein.-con. slab spans Swink Branch, Route SF, WPSO 770A, St. Francois Co.; three 8 ft. rein.-con. slab spans over stream, Route SD, WPSO 772, road from Farmington North, St. Genevieve Co.; one 51 ft. I-beam span sidewalks, wrought iron deck, over Missouri Pacific R.R., on Ivory Ave., Route 61, Project WPGM 80B, St. Louis Co.; one 70 ft. and two 60 ft. steel I-beam spans, continuous concrete floor, over Sac River, Route SF, WPSO 679, on road from Route St. to Route 66, Greene Co.; three 35 ft. rein.con. deck girder spans over Mill Creek, Route SD, WPSO 682A, road from Lebannon Southeast, LaClede Co.; two 8 ft. rein.-con. slab spans over stream, Route [illegible] WPSO 743B, Howell Co.; one 49 ft. and [illegible] 33 ft. I-beam spans over overflow of La[illegible] North Fork of White River, Ozark Co.; one [illegible] ft. I-beam span over Lateral 7 Ditch, Route [illegible] WPSS 749, and one 39 ft. and two 23 [illegible] I-beam bridges over Stephenson Bayou, Ro[illegible] SK, WPSS 436, state road from Route ST[illegible] Birds Mill, both Mississippi Co. T. H. Cut[illegible] state hy. engr.

New Jersey—Mar. 16, by E. D. Sterner, st[illegible] hy. comr., Trenton, constructing bridge to ca[illegible] Route 6, Sect. 7, across tracks of Bergen [illegible] Branch Erie R.R., Bergen Co., incl. 1,212 cu[illegible] excav., 462,000 lb. structural steel, 212,000 [illegible] reinforcement steel, and elimination of gr[illegible] crossing of Central Ave. and tracks of Cen[illegible] R.R. Co. of New Jersey, in Westfield, Union [illegible] 16,000 cu.yd. roadway excav., 992,560 lb. st[illegible] tural steel

N. Y., New York—See "Sewerage and Wa[illegible] Disposal."

Oregon—See "Streets and Roads."

Pennsylvania—Mar. 20, by W. Van D[illegible] secy. Hys., Harrisburg, repairing existing st[illegible] bridge, constructing rein.-con. pavement, e[illegible] R-639, Sect. 10, Trafford Borough, Allegh[illegible] and Westmoreland Counties, incl. 100 cu[illegible] Class 1 and 72 cu.yd. Class 2 excav.; p[illegible] truss bridge, dual type pavement, consisting [illegible] two 10 ft. lanes of rein.-con. pavement, et[illegible] 4,067 ft., R-3, Sect. 2, Montour Twp., town [illegible] Bloomsburg, Columbia Co., 9,893 cu.yd. C[illegible] 1, 2,775 cu.yd. Class 2 and 4,463 cu.yd. borro[illegible] excav.; plate girder and rein.-con. bridge, rein[illegible] con. pavement, etc., grading, drainage 6[illegible] ft. R-335, Sect. 1, Jefferson Twp., Lackawan[illegible] Co., 30,703 cu.yd. Class 1 and 1,103 cu.[illegible] Class 2 excav.

Pa., Sharon—Mar. 9, by Comrs. Mercer C[illegible] Mercer, constructing Bridge 2302 over Pine R[illegible] on South Oakland Ave. P.W.A. project. Car[illegible] line Armstrong, clk.

Vermont — Mar. 12, by Missisquoi Brid[illegible] Comn., E. T. Bradley, chn., Swanton, co[illegible] structing approach embankments, with pr[illegible] tected slopes to bridge proper across Missisqu[illegible] Bay, Lake Champlain, between points appro[illegible] imately 1,100 ft. northerly from the Centra[illegible] Vermont Railway Trestle at East Alburg [illegible] and 475 ft. northerly from said trestle on We[illegible] Swanton end on Route 104. Bridge about 8[illegible] ft., total of bridge and approaches about 4,20[illegible] ft., rein.-con., steel construction. $475,000. P.W.A. project. H. E. Sargent, ch. engr. A. [illegible] Bishop, engr., Montpelier.

Virginia—See "Streets and Roads."

West Virginia—See "Streets and Roads."

CONTRACTS AWARDED

California—N. M. Ball Sons Co., general con[illegible] tractors, P. O. Box 404, Berkeley, reinforcing steel for undergrade crossing under tracks of Southern Pacific R.R., south of Red Bluff, Tehama Co., to Truscon Steel Co., Atlas Bldg., San Francisco, for State Hy. Comn., Sacramento ***structural steel, to Ingalls Iron Wks., 2318 Encinal Ave., Alameda***cement, to Cowell Lime & Cement Co., 2 Market St., San Francisco. Noted Jan. 15, C. D.—Jan. 23, E. N.-R. under "Contracts Awarded."

★ **Illinois**—Dpt. P. Wks. & Buildings, Div. Hys., Springfield, substructures for subway structures in Chicago, Cook Co., and flooring lighting system, etc., for same structure, to Bates & Rogers Constr. Co., 111 West Washington St., Chicago, $138,103 and $31,223 respectively***erecting steel for same bridge, to Ferro Constr. Co., 37 West Van Buren St., Chicago, $20,749***painting structural steel for same bridge, to Overland Constr. Co., 205 West Wacker Dr., Chicago, $5,778***viaduct in Pike Co., to Clinton Bridge Wks., Clinton, Ia., $46,703*** bridges in Cumberland Co., to M. C. Robinson, Girard, $4,799***in Macoupin Co., to M. C. Merrills, Belleville, $34,203***in Morgan Co., to Sangamo Constr. Co., Springfield, $32,841*** in DuPage Co., to Standberg Bros. Co., 608 South Dearborn St., Chicago, $94,240***in Adams Co., to E. D. Otto, Inc., Downers Grove, $20,050*** in McLean Co., to Porter-McCully Constr. Co., Mackinaw, $57,125***structural steel for bridge in Cook Co., to Bethelehem Steel Co., 400 North Michigan Ave., Chicago, $99,594***substructure for bridge in Bond Co., to Pickus Eng. & Constr. Co., 38 South Dearborn St., Chicago, $23,458*** 2 rein.-con. bridges in Macoupin Co., to Madison Constr. Co., Edwardsville, $39,822. Grand total $648,688. Bids Jan. 3 and 17. Noted Jan. 9 and 24, C.D.

Indiana—State Hy. Dpt., Indianapolis, 2 span 120 ft. bridge over Rock Creek, Bartholomew Co., to H. Tharp, Fountain City, $21,847 est. $23,854; 40 ft. rein.-con. bridge in Bartholomew Co., to J. C. Jarrett & Son, Lynn, $9,293 est. $10,198. Bids Feb. 4. Noted Feb. 7, C. D.—Jan. 23, E. N.-R.

Kentucky—See "Streets and Roads."

Mass., Springfield—City, C. W. Phillips, supt. Dpt. Streets & Engineering, Administration Bldg., general contract Armory St. bridge, to A. L. Phelps, Inc., 496 Bridge St., $23,820*** structural steel, to Bethlehem Steel Co., 8th and Lehigh St., Bethlehem, Pa.***concrete, to Valentine Lumber & Supply Co., 102 Albany St. ***reinforcing steel, to A. D. Donald & Co., 62 Main St., Springfield. Noted Feb. 13, C. D.— Jan. 23, E. N.-R.

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†*Federal Government.*

Bridges, etc. (Continued)

Minnesota—See "Streets and Roads."

New York — Dpt. Pub. Wks., State Office Bldg., Albany, steel and concrete grade crossing elimination over Pennsylvania R.R. tracks at Eaton Ave., to Metzger Constr. Co., 429 Carlton St., Buffalo, $166,356. Est. $167,000. Bids Feb. 11. Noted Feb. 17, C. D.—Jan. 30, E. N.-R., under "Streets and Roads."

New York—E. Smith Eng. & Contg. Co., general contractors, 209 Strathmore St., Syracuse, reinforcing steel for bridge in Cayuga Co., for Dpt. P. Wks., Albany, to American Steel & Wire Co., Heffernon Bldg., Syracuse. Noted Nov. 15, C. D.—Nov. 21, E. N.-R.

New York — Triborough Bridge Authority, 111 8th Ave., New York, end ramp paving Queens approach of Triborough Bridge, Contr. 50, to P. T. Cox Contg. Co., 154 Nassau St., New York, $426,085. P.W.A. Bids Dec. 30. Noted Jan. 2, C. D.—Dec. 26, E. N.-R.

★**New York** — Triborough Bridge Authority, 111 8th Ave., New York, paving Wards and Randalls Island Viaducts of Triborough Bridge, Contr. 61, to Tully & DiNapoli, 30-11 12th St., Long Island City, $571,245. P.W.A. Noted Jan. 27, C. D.—Jan. 30, E. N.-R.

Pennsylvania—See "Streets and Roads."

Rhode Island—State and Providence Plantations, Div. of Contracts, Standards & Purchases, State House, Providence, Bradford Railroad Bridge 365, and approaches, Westerly, to C. W. Blakeslee Co., Inc., 58 Waverly St., New Haven, Conn., $84,147; Wickford Hill Railroad Bridge 370 and approaches, North Kingston, to Seaboard Constr. Co., 434 Allens Ave., Providence, R. I., and 201 Marginal St., Chelsea, Mass., $54,524. Bids Feb. 3, awarded Feb. 24. Noted Feb. 13, C. D.—Jan. 30, E. N.-R.

South Dakota—See "Streets and Roads."

Vermont—State Hy. Dpt., H. E. Sargent, ch. engr., Montpelier, steel, concrete bridge with gravel approaches on Route 3, WPSO 213-A, Middletown Springs, to Bristol Constr. Co., Bristol, N. H., $13,500•••steel I-beam bridge with gravel mixed in place surface course approaches, Project WPSS 189-A, Willison, to H. E. Calkins, Danville, $19,979. Bids Feb. 7, awarded Feb. 24. Noted Feb. 17, C. D.

Washington—See "Streets and Roads."

Wis., Milwaukee—City, R. E. Stoelting, comr., repairing pile, timber protection work at Bway. and North Water St. bridges, to E. E. Gillen Co., 626 East Wisconsin Ave. $9,963. Bids Feb. 14, awarded Feb. 17.

STREETS AND ROADS

BIDS ASKED

Alabama—Mar. 12, by State Hy. Comn., c/o G. Scott, pres., Montgomery, asphalt paving 0.319 mi. Broad St., Selma, Dallas Co. $25,000.

Arizona — Mar. 13, by State Hy. Dpt., Phoenix, oiling 25.3 mi. Boulder Dam-Kingman Hy., Mohave Co. $165,000. T. S. O'Connell, Phoenix, state hy. engr.

Connecticut—Mar. 16, at office of J. A. Macdonald, state hy. comr., Hartford, bituminous concrete or Class H bituminous (asphaltic concrete) paving Colprovia process 4.874 ft. Grove and South Main Sts., N.R.M.74, Putnam; rein.-con. paving 24,666 ft. and bituminous macadam paving 665 ft. U. S. Route 6-A, F.A.P. 54-D, Andover and Columbia; rein.-con. paving 2,424 ft. Route 9, at Corey's Hill, F.A.P. 39-C, Cromwell and Rocky Hill; rein.-con. paving 8,030 ft. Route 14, F.A.P. 28-D, East Hampton; 9,517 ft. Route 9, from approach to Connecticut River Bridge, F.A.P. 39-B, Middletown and Cromwell; rolled screened gravel surfacing 3,072 ft. Havemeyer and Broglum-Finch Drives and Dunn Ave., Stamford; grading, drainage 13,575 ft. Merritt Parkway, Stamford.

Conn., Bridgeport—See "Contracts Awarded."

Conn., Greenwich—See "Contracts Awarded."

Conn., Norwalk—See "Contracts Awarded."

Delaware—Mar. 11, by State Hy. Dpt., Dover, concrete paving, etc., 7.907 mi. Mt. Pleasant-Tybount Corners Rd., Contr. 459, New Castle Co., 5,260 cu.yd. unclassified excav.; 8.783 mi. Waples Pond-Five Points Rd., Contr. 444, 5,500 cu.yd. unclassified excav.; 9.02 mi. Milford-Waples Rd., Contr. 443, 6,000 cu.yd. unclassified excav., both in Sussex Co.; bituminous concrete surface course paving, etc., 0.409 mi. Lancaster Ave. Rd., Wilmington, Contr. 432, New Castle Co., 2,850 cu.yd. unclassified excav.; 0.477 mi. East 30th St., Wilmington, Contr. 440, 4,300 cu.yd. unclassified excav., New Castle Co.; bituminous concrete on broken stone paving 0.436 mi. Dover School St., Contr. 456, Dover, Kent Co., 2,400 cu.yd. unclassified excav.; clearing, grubbing, shaping, 4.146 mi. St. Johnstown-Bakers Corner Rd., Contr. 375; roadway shaping 1.424 mi. Milton-D. and M. R.R. Rd., Contr. 415; 0.992 mi. Browns Church Cannons Rd., Contr. 417, 15 cu.yd. earth excav., all foregoing Sussex Co.; fencing 8.8 mi. Summit Bridge-Glasgow Rd., Contr. 326-B; 2.5 mi. Holly Oak-Claymont Rd., Contr. 395-B.

Indiana—State Hy. Comn., Indianapolis, rejected bids Jan. 7, bituminous retread paving 12.04 mi. road in Huntington and Wells Counties. $213,691. Will readvertise. Noted Jan. 10, C. D.

Kansas—Mar. 11, by State Hy. Comn., at office of County Clerk, Kansas City, earthwork, culverts, bridging, roadside improvement, sand gravel surfacing 26.053 mi. hys. in Brown, Douglas, Lyon, Nemaha, Osage and Wyandotte Counties.

Kansas — Mar. 13, by State Hy. Comn. at office of County Clerk, Russell, earthwork, concrete paving, bridging, curbing, guttering, roadside improvement, resurfacing, concrete paving, sand gravel for cover material 45.267 mi. hys. in Ellis, Graham, Norton, Osborne, Rawlins, Russell and Trego Counties.

Missouri—Mar. 13, by State Hy. Dpt., Jefferson City, concrete surfacing 2.295 mi. Route 71, FAP 14-1, St. Joseph to Fawcett Rd., Buchanan Co.; 4.944 mi. Route SD, WPSO 622B, Route 5 to Route D, Charlton Co.; graded earth and graveling 0.462 mi. Route 63, WPMS and WPSO 757A and B, Lancaster South Rd.; 0.112 mi. Route 63, WPH 758, same road, both Schuyler Co.; 0.301 mi. Route 54, WPGH 126-B1, Mexico East; 0.447 mi. Route 22, WPGH 303G1, Mexico West, both Audrain Co.; 0.051 mi. Route 50, WPH 246D, Warrensburg West Rd., Johnson Co.; 6.878 mi. Route SE, WPSO 659A and B, Moniteau Co.; 1.143 mi. Route SV, WPSO 767A, Valles Mines Route 61 Rd., Jefferson Co.; 4.189 mi. Route SF, WPSO 770A, Farmington East Rd., St. Francois Co.; 4.249 mi. Route SD, WPSO 772, Farmington North Rd., St. Genevieve Co.; 0.151 mi. Route 61, WPGM 80B, on Ivory Ave., St. Louis Co.; 4.532 mi. Route SF, WPSO 679, Route T to Route 66 Rd., Greene Co.; 4.185 mi. Route SD, WPSO 682A, Lebannon South Rd., Laclede Co.; 4.488 mi. Route SH, WPSS 701A, Route 66-Route E Rd., and 1.308 mi. Route SH, WPSS 701B, Route 66-Route E Rd., both Pulaski Co.; 4.774 mi. Route SC, WPH 425A, Gainesville West Rd., Ozark Co.; 1.101 mi. Route SJ, WPSO 777A, Higdon Northeast Rd., Madison Co.; 0.45 mi. Route SJ, WPSO 777B, Higdon Northeast Rd., Bollinger Co.; 0.685 mi. Route SJ, WPSO 777C, Higdon Northeast Rd., Perry Co.; 0.089 mi. Route SH, WPSS 749, Route 55 to Dorena Rd., Mississippi Co.; 0.63 mi. Route 60, WPMH 5B, in Sikeston, Scott Co.

Nevada—See "Contracts Awarded."

New Jersey—Mar. 16, by E. D. Sterner, state hy. comr., Trenton, constructing 5.911 mi. Route 25, Sect. 24 from Burlington to Crystal Lake, Burlington Co., incl. 121,510 cu.yd. roadway, borrow and wet excav.; and Route 44 Sects. 2A, 4A and 7 from Oldman's Creek to Penns Grove, Salem Co., 29,594 cu.yd. roadway and borrow excav. Noted Jan. 14, C. D.—Jan. 16, E. N.-R.

N. J., Trenton—Mar. 10, by P. Morton, city mgr., vitr. brick and asphalt paving East Front, West Front and Lalor Sts., South Clinton and Hamilton Aves. $135,000. J. E. English, city engr.

N. Y., Brooklyn—Mar. 11, by R. V. Ingersoll, pres. Brooklyn Boro, Boro Hall, asphalt on concrete paving Manhasset Pl., 8th Ave., Decatur, Sandford, South 4th and 8th Sts.

N. Y., Eastchester—See "Contracts Awarded."

N. Y., New York—See "Sewerage and Waste Disposal."

†**N. Y., Salamanca**—See "Contracts Awarded."

N. Y., Tuckahoe—See "Contracts Awarded."

N. Y., Union—See "Contracts Awarded."

Oregon—Mar. 13, by State Hy. Comn., Salem, grading 2.17 mi. Bear Creek-Bare (Co.), Mt. Summit Section, Wolf River Hy., Clatsop and Tillamook Counties; grading 0.65 mi. and 0.56 mi. bituminous macadam paving approaches to Yaquina Bay Bridge on Oregon Coast Hy.; and grading 1.5 mi. and surfacing 4.75 mi. Toledo-Simpson Creek Section, Corvallis-Newport Hy., Lincoln Co.; grading 0.79 mi., rock surfacing 4.06 mi., bituminous macadam surfacing 0.68 mi. and oil mat surfacing 3.61 mi. 4 sections county line, Yamhill Co.; 5,500 cu.yd. rock in stockpile on Sherman-Biggs-Moro Rock Production Project, Sherman Co.; constructing composite pile trestle bridge over Wallowa River and 2 concrete box culverts and extension to 3 culverts on Enterprise-Josep Section, Wallowa Lake Hy., Wallowa Co.

Pennsylvania — Mar. 20, by W. Van Dyke, secy. Hys., Harrisburg, rein.-con. paving, rein.-con. structure, concrete and bituminous surface on crushed aggregate base for flares 10,935 ft. R-141, Sect. 4, Tilden Twp., Berks Co., incl. 40,245 cu.yd. Class 1 and 1,136 cu.yd. Class 2 excav.; bituminous on native stone paving 3,323 ft. R-101-7 Ext., Slippery Rock Twp., Slippery Rock Boro, Butler Co., 6,773 cu.yd. Class 1 and 107 cu.yd. Class 2 excav.; grading, drainage, 2 rein.-con. structures 6,469 ft. R-68, Burrell Twp., Indiana Co., 26,615 cu.yd. Class 1 and 4,103 cu.yd. Class 2 excav.; bituminous on native stone paving 3,375 ft. R-177, Sect. 1, Fairmount Twp., Luzerne Co., 1,727 cu.yd. Class 1, 161 cu.yd. Class 2 and 156 cu.yd. borrow excav.; bituminous on native stone or modified crushed aggregate paving, 2 rein.-con. bridges 11,431 ft. R-46016, Limerick and Upper Providence Twps., Montgomery Co., 9,886 cu.yd. Class 1 and 556 cu.yd. Class 2 excav.

Texas—G. Gilchrist, state hy. engr., Austin, rejected bids Dec. 20, grading, drainage structures 6.504 mi. State Hy. 6, W.P.M.H. 12, B and D, McLennan Co. Will readvertise. Noted Jan. 6, C.D. New P.W.A. project.

★**Virginia**—Mar. 17, by State Hy. Dpt., Richmond (S.P. means State Project and F.P.

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†*Federal Government.*

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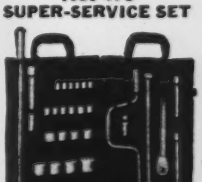

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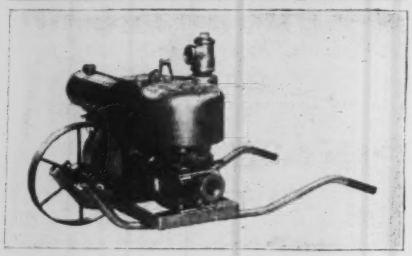

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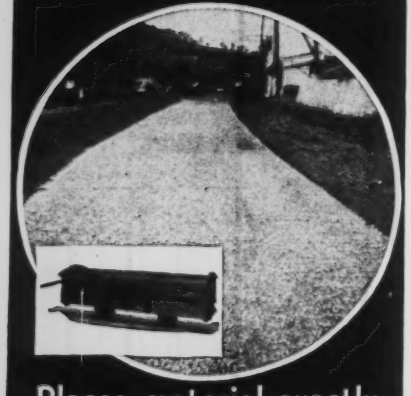

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Streets and Roads (Continued)

Federal Project) bituminous macadam paving 4 mi. Route 12, S.P. 1022-EB2, F.P. 481-B, Augusta Co., incl. 41,067 cu.yd. excav.; 0.1 mi. Route 29, S.P. WPMH-1043-M3, F.P. WPMH 557-B, in Warrenton, 1,091 cu.yd. excav.; 4.4 mi. Route 29, S.P. WPGS-1130-AB1, F.P. WPGS 557-A, 46,324 cu.yd. excav.; and 3.2 mi. Route 3, S.P. 510-A1, B1, F.P. 318-F, 58,604 cu.yd. excav., both Culpeper Co.; 6.4 mi. in Floyd, 5.7 mi. to North Floyd and 8 mi. in South Floyd, Route 211, S.P. 620-F4G1, 2, B3, 4, 5, 6 and F.P. 486-BC; 0.4 mi. Route 11 S.P. WPGH-789-EB1, 3, F.P. WPGH 27, Smith Co., incl. 6,214 cu.yd. excav.; 0.1 mi. Route 11, S.P. 589-M4, F.P. WPHM 339-H, Shenandoah Co., 287 cu.yd. excav., 5 mi. Route 100, S.P. 1008-A2M1 B1, F.P. 488-A, Pulaski Co., 99,526 cu.yd. excav.; 0.5 mi. Route 211 S.P. WPMH 1027-K, F.P. WPMH 419-C, in Roanoke, 1.5 mi. Route 11, S.P. 151-DR1, F.P. 151, Wythe Co., 20,231 cu.yd. excav.; curbing, guttering 0.3 mi. Route 220, S.P. WPMH-1031 M1, WPMH-374-B, Martinsville, 404 cu.yd. excav.; curbing, guttering, concrete paving 0.25 mi. Route 12, S.P. WPMH 751-M1, F.P. WPMH-482-D, in Front Royal; concrete paving 0.07 mi. Route 58, S.P. WPMH-194-A1, F.P. WPMH-74, Virginia Beach, 315 cu.yd. excav.; 0.1 mi. Route 60, WPMH-615-M1, F.P. WPMH-117-A, Williamsburg, 413 cu.yd. excav.; 2.5 mi. Route 1, S.P. NRH-358-KW2, F.P. NRH 372-D, Caroline Co., 5,358 cu.yd. excav.; graveling 0.2 mi. Route 7, S.P. WPMS-1378-M1, F.P. WPMS-541-A, Falls Church, 1,493 cu.yd. excav.; 0.1 mi. Route 58, S.P. WPMH-160-M1, F.P. WPMH-106, Southampton, 3.4 mi. Route 5, S.P. WPSS-794-A1, 3 F.P. WPSS-539-A, Charles City, 5,210 cu.yd. excav.; 3.5 mi. Route 1, S.P. NRH-358-KW2, F.P. NRH 362-D, Caroline Co. 5,358 cu.yd. excav.; constructing overhead bridges and approaches, Route 161, S.P. WPGS 1124-AB1, F.P. WPGS-523-A, Henrico Co., 55,507 cu.yd. excav.; constructing 37 ft. bridge, Route C-1432, S.P. C-1432-B, Roanoke Co., 262 ft. bridge on Route 12, S.P. 751-B5, F.P. 482-B; 200 ft. bridge on Route 12, S.P. 751-B6, F.P. 482-C, both Page Co. $1,000,000.

West Virginia — Mar. 10, by State Road Comn., Charleston, grading, draining 2.93 mi. Wellsburg-Fowlerstown Rd., U. S. Wks. Project WPMH 231-B, Brooke Co.; 3.026 mi. Ronceverte-Alderson Rd., U. S. Wks. Project, PWS Docket 2197-865, Greenbrier Co.; 3.352 mi. Fairmont-Mannington Rd., U. S. Wks. Project, PWS Docket 2197-847-B, Marion Co.; 1.962 mi. Simmons McDowell County Line Rd., U. S. Wks. Project WPH 215-1, Mercer Co.***2.434 mi. Fallen Timber-Jacksonburg Rd., U. S. Wks. Project WPS Docket 2197-855, and 3.301 mi. Fallen Timber-Jacksonburg Rd., U. S. Wks. Project NRS 243-A, both Wetzel Co.; grading, draining, stone base and road mix on 0.622 mi. Grantsville-Creston Rd., U. S. Wks. Project WPSS 209-C, Calhoun Co.; grading, draining surface base treated stone surfacing 4.193 mi. Nallen-U. S. Route 60 Rd., U. S. Wks. Project WPSS 253-A, Fayette Co.; 1.24 mi. Dolph-Simmons Rd., U. S. Wks. Project WPMH 215-F, Mercer Co.; macadam base surfacing 3.055 mi. Moorefield-Baker Rd., U. S. Wks. Project, PWS Docket 2197-852-B, Hardy Co.; surface treated stone base surfacing 0.301 mi. Largent Bridge and approaches, U. S. Wks. Project PWS 2197-843-C, Morgan Co.; 4.747 mi. Fisher Bridge-Largent Rd., U. S. Wks. Project, PWS 2197-843-D, Morgan Co.; new railing and repairs to Kanawha City Bridge 912.2, U. S. Wks. Project, PWS Docket 2197-864, Kanawha Co.***grading, draining, concrete paving 2.178 mi. Project 155-I and 0.662 mi., part 155-C Kingmont-White Hall Rd., Marion Co.; bridge approaches and grading, draining and asphaltic concrete on concrete paving 0.524 mi. Armstrong St.-Keyser Bridge, U. S. Wks. Project, PWS Docket 2197-858 A and B, Mineral Co.; grading, draining, asphaltic concrete on stone surfacing 0.169 mi. Cherry Run bridge and approaches, U. S. Wks. Project, PWS 2197-843-B, Berkeley and Morgan Counties; surface treated, macadam base surfacing 5.63 mi. Brookside-Breedlove Rd., U. S. Wks. Project PWS 2197-859, Preston Co.; hauling top course stone for 12.211 mi. Spencer-Newton Rd., State Project 3416C B-1, Roane Co.; asphaltic concrete paving, relaid vitr. brick on 2.022 mi. Grafton St., U. S. Wks. Project, WPMS 248-A, Taylor Co.; constructing steel superstructure and concrete substructure for Tyler City Bridge 1410, one 100 ft. pony truss and two 50 ft. I-beam spans, U. S. Wks. Project, PWS Docket 2197-860-A, Tyler Co.; constructing Goose Creek Bridge 1414, three 50 ft. I-beam spans on concrete substructure, U. S. Wks. Project, PWS Docket 2197-855-B, Wirt Co.; constructing Rockcastle Creek Bridge 1409, two 30 ft. I-beam spans on concrete substructure, U. S. Wks. Project, PWS 2197-862, Wyoming Co. A. Lyle Fleshman, secy.

CONTRACTS AWARDED

Alabama — State Hy. Comn., c/o G. Scott, asphalt paving 0.44 mi. hy. city of Montgomery, NRM 194C, Montgomery Co., to Dunn Constr. Co., Chamber of Commerce Bldg., Birmingham, Ala., $73,170. Noted Feb. 19, C. D.

Arizona—State Hy. Comn., Phoenix, grading, draining 0.8 mi. Phoenix Prescott Rd., to Phoenix Tempe Stone Co., Phoenix, $44,644. Bids Jan. 30. Noted Feb. 10, C. D.—Jan. 23, E. N.-R.

Arkansas — State Hy. Comn., Little Rock, grading, drainage structures 4.8 mi. Heber Springs Rd., Cleburne Co., to O. B. Robbins, Heber Springs, $31,120 est. $40,000; concrete paving 8.7 mi. Hy. 67, White Co., to A. Kennedy, Poyen, $89,952 est. $100,000. Bids Feb. 27. Noted Feb. 18, C. D.—Feb. 20, E. N.-

California—State Hy. Comn., P. Wks. Bid Sacramento, grading, concrete paving 3.1 mi. hy. between Tajiguas Creek and Arroyo Hon Santa Barbara Co., to Granfield-Farrar & C lin, 67 Hoff Ave., San Francisco, $202,820* grading, asphaltic concrete paving 2.4 mi. between Richfield Tower and Santa Maria Riv Santa Barbara and San Luis Obispo Counti to Heafey-Moore Co., 344 High St., Oakla $66,555. Bids Feb. 13, awarded Feb. 25. No Feb. 21, C. D.—Jan. 30, E. N.-R.

California — C. H. Purcell, engr. State H Dpt., 808 State Bldg., Los Angeles, grading mi. hy. Polamar Mountain Rd. between Ir Spring Creek and Observatory site, to Bas Bros., 20,530 Normandie Ave., Torrance, $20 370. Bids Jan. 30, awarded Feb. 19. No Jan. 31, C. D.

★ **California**—C. H. Purcell, engr. State H Dpt., 808 State Bldg., Los Angeles, gradi 3.7 mi. Sepulveda Blvd., from San Fernando R to Brand Blvd., to Griffith Co., Railway Bl Los Angeles, $464,533. Bids Feb. 6, award Feb. 19. Noted Feb. 7, C. D.

Conn., Bridgeport—City, constructing n 700 ft. street between Burr Rd. and Waken St., to be called Burr Court, $20,437; build walks, drives and curbs of concrete, $9,14 W.P.A. labor. F. Toquet, City Hall, engr.

Conn., Greenwich—City, improving Pemb wick Rd. between Glenville and Post R W.P.A. labor. $33,945. P. L. Minor, Tow Hall, Greenwich, engr.

Conn., Middletown—State Hy. Comn., P. Wk Dpt., constructing 60 mi. Farm-to-Market roa in suburbs, W.P.A. labor under P. Wks. I $87,699. G. A. Schaefer, P. Wks. Dpt., Midd town, engr.

Conn., Norwalk—City, P. Wks. Dpt., impro ing, paving, repairing all Norwalk streets a roads not in the Federal Aid Hy. System, W.P. labor. Est. $44,325. P. James, City Ha engr.

Illinois—Dpt. P. Wks. & Buildings, Div. Hy Springfield, grading 9.83 mi. Sect. 120, WPH NH and 121A WPH-MH, road from McLean t Heyworth, McLean Co., to F. C. Feutz, Paris $37,700***2.3 mi. S.A. Route 1, Sect. 10 road, to Birt Constr. Co., Decatur, $68,907*** 3.42 mi. road from east of Route 121 east t south of Armington, Logan Co., to O'Conno Constr. Co., Springfield, $59,958***2.04 mi road from Blairsville east in Hamilton Co. t Harrelson & Johnson, Harrisburg, $17,220*** 1.1 mi. Route 48, Sect. 128-WPMH, Decatur South Belt from Route 48 to Route 2, Macon Co., to File & Collins, Decatur, $51,785***4.1 mi. road from Farina East to Clay Co. line i Fayette Co., and 5.08 mi. road from Route 13 toward Wakefield, Richland Co., to O. Arnold Casey, $22,972 and $20,294 respectively***bi tuminous road surfacing 4.94 mi. S.A. Rout 3, Sect. 6, WPSO-MS, road from Brookport t Route 145, Massac Co., to L. Marsh, Morrison ville, $37,569. Grand total $316,414. Noted Jan. 3, 24 and 27.

Indiana — State Hy. Comn., Indianapolis crushed stone surfacing 2.776 mi. road i Davies and Martin Counties, to U. R. Pric Bloomington, $45,939. Est. $56,089. Bids De 17. Noted Dec. 3, C. D.—Dec. 5, E. N.-R.

Indiana — State Hy. Comn., Indianapolis crushed stone surfacing 6.655 mi. road i Pulaski Co., to Heiny & McVay, Gary, $62,95 Est. $93,511. Bids Jan. 7. Noted Jan. 10, C. D.

Kentucky—State Hy. Comn., Frankfort, rein con. paving 0.386 mi. Murray-Mayfield Rd. WPMS 485-A-GS, Calloway Co., to McDade & McDade, Mayfield, $18,273***grading, drainage 0.757 mi. Smithland-Dycusburg Rd., WPSO 423-AG, Livingston Co., to J. F. Mulligan, Inc., Greenville, $12,489***one 150 ft. steel truss span for bridge superstructure over Goose Creek on Manchester-Hyden Rd., WPSS 245-A B, Clay Co., to Ruth Bros., Georgetown, $13,746. Grand total $34,508. Bids Dec. 20, State Hy. Comn., Frankfort, rejected bids opened Dec. 20, surfacing 0.132 mi. Main St. in Madisonville, NRM 41-GS, Hopkins Co.

Maryland—State Roads Comn., Baltimore grading, drainage 4.46 mi. Contr. F-272-525 along Hagerstown-Myersville-Frederick Rd., Frederick Co., to M. J. Grove Lime Co., Lime Kiln, $128,744. Noted Dec. 19, C. D.

Md., Baltimore—Bd. Awards, repairing sheet asphalt paving in Northern District, to National Paving & Contg. Co., Menlo Dr. and Western Md. R.R., $91,422***Western District, to Baltimore Asphalt Block & Tile Co., 1320 North Monroe St., $95,150***Central District, to American Paving & Contg. Co., 2525 Montebello Ave., $94,826***Eastern District, to P. Flanigan & Sons, Harford Rd. and 25th Ave., $92,491. Grand total $373,889.

Mass., Newton—E. H. Harvey, city engr., bituminous macadam surfacing, drainage 38,550 sq.yd. Commonwealth Ave. and Center St., P.W.A. 1269, to Simpson Bros. Corp., 193 Hanover St., Boston, $32,817***37,000 sq.yd. Adams St., Auburndale Ave., Walnut St., etc., P.W.A. 1270, and 33,125 sq.yd. Beacon St., Lowell Ave., Ward St., Waverly Ave., etc., to John P. Condon Corp., Coolidge Hill Rd., Watertown, $46,338 and $47,747 respectively. Grand total $126,902. Bids Feb. 7, awarded Feb. 24. Noted Feb. 26, C. D.

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†*Federal Government.*

Streets and Roads (Continued)

Minnesota—State Hy. Dpt., St. Paul, grading 3... mi. Projects 86-01 and 86-02, Wright Co., and WPSO 728 and 729, incl. 164,824 cu.yd. ex..., to W. N. Petrie & Son, Champlin, $31,-5... Bids Jan. 17. Noted Jan. 10, C. D.

Minnesota—State Hy. Comn., St. Paul, im...ving 8.2 mi. State Project 11-1137-3C, FAP ...H. between Frontier-Birchardale Rd., incl. ...428 cu.yd. excav., to Thoreen, Sandeen & ...tton, Stillwater, $64,387***11 culverts on ...e road, to Megarry Bros., Bain, $29,540*** ...ing 6.7 mi. S.P. 23-185-21-2C, FAP 5031, ...ween Kerrick and North County line, 269.-... cu.yd. excav., to Franzen Bros., Palisade, ...600***10 mi. S.P. 71-4-52-2 FAP 13R and ... between Junction Trunk Hy. 14 and point ... mi. east of Rowena, to Volden Bros., Milan, ...295***9 mi. road between west state line and 9 mi. east, S.P. 212-155-21-A, 169,427 cu.yd. excav., to R. P. Englund & L. Shipman, Sleepy Eye, $24,988. Grand total $227,810. Bids Feb. 4. Noted Jan. 16, C.D.—Jan. 23, E.N.-R.

Missouri—State Hy. Comn., Jefferson City, to Tobin Quarries, Inc., 220 West 39th St., Kansas City, stone haul surfacing 2.877 mi. Route 40 to Saline Co. Rd., Sect. 10B, $7,108; 2.781 mi. same road, Sect. 11B, $6,891; 4.08 mi. Sect. 12B, same road, $10,102; 0.909 mi. same road, Sect. B13B, $2,147***to J. A. Kerr, Ozark, graveling 4.669 mi. Winona-Fremont Rd., Sect. 60, Shannon Co., $4,945***to A. L. Cook, Ottawa, Kan., 2.765 mi. Lamar-Golden City Rd., Sect. 7, $6,639; 2.37 mi. Sect. 8A, same road, $3,877; 1.076 mi. Sect. 9A, same road, $478; 2.883 mi. Sect. 10A, same road, $4,412; 4.847 mi. Sect. 11A, same road, $6,964; 3.045 mi. Sect. 12A, same road, $3,337, all foregoing Barton Co.***to Davis Constr. Co., Inc., Boonville, 3.763 mi. Vienna-Southwest Rd., Sect. 8B, $2,253; 3.931 mi. Sect. 9B, same road, $2,557, both Maries Co.***to C. E. Rich Gravel Co., Kirkwood, 3.577 mi. Eolia-Louisiana Rd., Sect. 1A, $6,252; 3.864 mi. Sect. 2B, same road, $6,008; 4.11 mi. Sect. 3A, same road, $2,779; 1.076 mi. Louisiana South Rd., Sect. 1D, $2,194, all foregoing Pike Co. Grand total $78,943. Bids Feb. 7. Noted Feb. 17, C.D.—Jan. 30, E.N.-R.

Nevada—State Hy. Comn., Carson City, concrete curbing, storm drains, graveling Pyramid Lake Route between Sparks and point 1.9 mi. north, day labor. $74,500. R. A. Allen, state hy. engr.

New Mexico—State Hy. Dpt., Santa Fe, grading, drainage structures, base course surfacing 6.344 mi. F.L.H. 2-C, Valencia Co., and oil processed surfacing and rock asphalt seal coat 16.493 mi. in Bernalillo and Valencia Counties, to L. R. Allison, Albuquerque, $103,525 and $144,932 respectively, est. $113,932 and $166,-806 respectively***grading, drainage structures, 2 course surfacing 2.787 mi. Valencia Co., to E. W. Everly, Albuquerque, $98,551 est. $97,933 ***rounding slopes, planting seeds, shrubs, trees and miscellaneous construction 2.012 mi. in Eddy Co., to F. O'McDaniel, Santa Fe, $11,623 est. $13,729***grading, drainage structures and 1 course crushed surfacing 5.492 mi. Lincoln Co., to Hayner & Burn, Las Cruces, $87,840 est. $99,276. Grand total $446,471. Bids Feb. 21. Noted Feb. 13, C. D.

New York—See "Bridges and Grade Crossings."

N. Y., Eastchester—Village, surfacing and installing storm water drains in Dunwoodie St. from Woodruff to Anderson Aves. $23,000, Altamont Ave. from Ewart to Dunwoodie Sts. $35,000, Anderson Ave. from Ewart to Dunwoodie Sts. $35,000, Lispenard and Allaire Sts. $27,000, by relief labor. Grand total $120,000. **W.P.A.** D. Jordon, High School, Main St., White Plains, Procurement Officer W.P.A., will purchase materials.

†**N. Y., Salamanca**—Bureau of Indian Affairs, Wash., D. C., clearing, grubbing, widening and graveling 12 mi. roads in Allegany Indian Reservation, relief labor. $105,230. **W.P.A.** H. F. Burd, 1014 City Hall, Buffalo, Procurement Officer W.P.A., will purchase materials.

N. Y., Tuckahoe—Village, installing telford base and resurfacing roadway, installing sewer, water drains, manholes, catch basins, 1,500 ft. in Columbus Ave., relief labor. $32,000. **W.P.A.** D. Jordon, High School, Main St., White Plains, Procurement Officer W.P.A., will purchase materials.

N. Y., Union—Village, widening, guttering, paving Pine, Oak, Walnut, Chestnut and Elm Sts., relief labor. Est. $30,000. **W.P.A.** O. K. Warwick, c/o owner, engr., C. V. Canale, Telephone Bldg., Binghamton, P.W.A. Procurement Officer will purchase materials.

North Dakota — State Hy. Dpt., Bismarck, grading, stabilized gravel and oil mix paving 7.17 mi. road west of Taylor, Stark Co., to Haggart Constr. Co., Fargo, $78,487. Bids Dec. 3. Noted Nov. 15, C. D.—Nov. 21, E. N.-R.

Ohio—J. J. Jaster, Jr., Ohio Hy. Dir., Columbus, grading, drainage structures, traffic bound paving 2.496 mi. Carroll Co., to Troyer Contg. Co., Andover, $15,092 est. $19,532***roadside improvement 0.644 mi. Butler Co., and 0.614 mi. Huron Co., to I. E. Inglenfritz & Sons Co., 708 East Front St., Monroe, Mich., $1,793 and $3,331 respectively est. $1,819 and $3,332 respectively***4.359 mi. Cuyahoga Co., and 2.507 mi. Medina Co., to L. Lucarelli, 1455 Washington Blvd., Mayfield Heights, $12,297 and $7,177 respectively, est. $2,799 and $7,179 respectively***2.239 mi. Sect. A Toledo Western Rd. State Hy. 537, State Route 246, and 2.526 mi. Sect. C Maumee Northern Rd. State Hy. 696, U. S. Route 20 N. both Lucas Co., to G. T. Browning Co., 613 Monroe St., Toledo, $3,484 and $3,594 respectively est. $3,887 and $4,019 respectively. Grand total $46,768. Bids Feb. 25. Noted Feb. 13, C.D.—Feb. 20, E.N.-R.

Pennsylvania—Dpt. Hys., Harrisburg, bituminous on modified base surfacing 0.09 mi. rein.-con. bridge on Route 258, Sect. 1, Crawford Co., to D. Parish, 907 Bellmont Ave., Youngstown, O., $5,540***0.17 mi. rein.-con. paving, rein.-con. arch, 0.05 mi. bituminous on native stone surfacing Route 120, Sect. 11-C, Westmoreland Co., to Freeland, Inc., 1 Penn Ave., Pittsburgh, $55,995. Noted Jan. 21, C. D.—Jan. 23.

Pa., York — York Co., grading, draining, graveling highway in Carroll Twp., day labor, $31,103. W.P.A. project. C. A. B. Zook, Lancaster, W.P.A. engr.

Rhode Island—State, Providence Plantations & Div. of Contrs., Standards & Purchases, State House, Providence, sheet asphalt Class "J" on 7 in. concrete paving 1.184 mi. WPMS-98, Contr. 3517, to J. J. McHale & Sons, Inc., 90 Ferris St., Pawtucket, $135,696. Noted Feb. 3, C. D.—Feb. 6, E. N.-R.

Rhode Island—State and Providence Plantations, Div. Contracts, Standards & Purchases, State House, Providence, sheet asphalt surfacing on concrete paving 1.349 mi. WPH R-5 and 77-C, Cranston and West Warwick, to M. A. Gammino, Constr. Co., 728 Valley St., Providence, $108,540, bids Jan. 27***rein.-con. paving 1.04 mi. Project WPH 52-D, Contr. 3509, Portsmouth, to Callan Constr. Co., Bay View Ave., Bristol, $89,057***mixed in place Type "D", Class "C" gravel pavement 1.353 mi. Ross Hill Rd., Project WPSO 105-B, Contr. 3522, Westerly, to Lawton Constr. Co., 79 Lenox Ave., Providence, $26,496. Bids Feb. 10, awarded Feb. 24. Grand total $224,093.

South Dakota—State Hy. Comn., Pierre, concrete paving 1.417 mi. Hand Co., to Woodrich Constr. Co., 613 Natl. Bank Bldg., Minneapolis, Minn., $49,689***grading 10.955 mi. Lyman Co., to G. W. England & Son, and Trottman Bros., Rapid City, $43,177***178 ft. overhead crossing in Brookings Co., to A. Hyde, Watertown, $20,735***26 ft. bridge in Union Co., to Booth & Olson, Inc., Sioux City, Ia., $11,001. Grand total $124,602. Bids Jan. 7. Noted Jan. 6, C. D.

Utah, Logan—Cache Co., graveling 20 mi. county roads, relief labor. $34,664. **W.P.A.**

Vermont—State Hy. Dpt., H. E. Sargent, ch. engr., State Hy. Dpt., H. E. Sargent, ch. engr., one course concrete paving 0.5 mi. WPMH 118-F, St. Johnsbury, to E. C. Hayden, Barre, $47,-629***gravel surface course 0.5 mi. WPSO 175-A, Halifax, to P. C. Ricci, Newport, $14,145 ***grading, base, drainage, double tack coat of refined tar 0.5 mi. Charlotte-Hinesburg Rd., WPSO 197-A, Charlotte, to B. A. Simeone, Inc., 107 Century St., Medford, $5,768. Grand total $67,542. Bids Feb. 7, awarded Feb. 24. Noted Feb. 17, C. D.

Washington—L. V. Murrow, dir. Hys., Olympia, grading, crushed rock surfacing, constructing rein.-con. overcrossing tracks S. P. & S. Ry. Co. 0.521 mi. County Rd., Cheney Plaza Rd., S. P. & S. overcrossing Cheney, U. S. Wks. Project WPGS 224-A, Spokane Co., to Goodfellow Bros., Inc., Wenatchee, $34,482***bituminous surfacing and rein.-con. overcrossing N. P. Ry. Co. 0.43 mi. State Rd. 11, Pasco overcrossing N. P. Ry. Co., U. S. Wks. Project WPGH 180-D, Franklin Co., to J. H. Collins & Co., Box 678, Walla Walla, $42,497***constructing partially treated timber trestle Crooked Creek Bridge, on County Rd., U. S. Wks. Project WPSO 262-A, Wahkiakum Co., to Makela Constr. Co., 253 Alameda Ave., Astoria, Ore., $7,106. Grand total $84,085. Noted Feb. 6, C. D.—Feb. 13, E. N.-R.

Washington—L. V. Murrow, dir. Hys., Olympia, concrete paving 0.333 mi. City St. Broadway from 37th St. to South Corporate Limits U. S. Wks. Project WPMS 264-A Snohomish Co., to E. J. Templeton & Co., 2924 Lombard Ave. Everett, $16,722***3.182 mi. County Rd. Gig Harbor to Point Fosdic, U. S. Wks. Project WPSO 254-A Pierce Co., to J. Warter, Sr., 631 North Fife St., Tacoma, $74,-689***clearing, grubbing, grading roadway 0.522 mi. State Rd. 5, Tieton Dam Vicinity, Federal Aid 211-B, Yakima Co., to Bjork Bros., Pearson & Strom, 302 McDowall Bldg., Seattle, $105,287***stockpiling, aggregate 36.1 mi. State Rd. 11, Ritzville to Franklin Co., Inc., Adams Co., to Rogers Constr Co., Dayton, $11,941*** bituminous macadam surfacing, 3.5 mi. County Rd. Walla Walla-North, U. S. Wks. Project WPSO 263-A Walla Walla Co., to Diesel Oil Sales Co., 2155 Northlake St., Seattle, $12,909 ***grading, bituminous macadam surfacing 4.243 mi. County Rd. Cowiche to Tieton, U. S. Wks. Project, WPSO 266-A Yakima Co., to F. G. Redmon, 303 South 5th Ave., Yakima, $67,-317. Grand total $288,865. Bids Feb. 18. Rejected. Bids Feb. 18, concrete and asphaltic concrete paving 0.61 mi. State Rd. 9 First St., in Port Angeles, U. S. Wks. Project WPMH 138-B and 166-B, Clallam Co. Noted Feb. 6, C. D.

†*Federal Government.*

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Los Angeles—Mar. 18, by City Harbor Dpt., City Hall, dredging in Los Angeles Harbor, 287,000 cu.yd. in East Channel-Wilmington Dist.;

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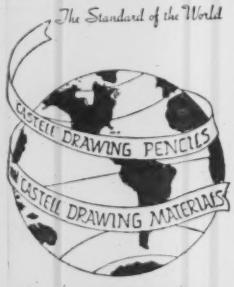

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BROWNING SHOVELS

Earthwork, etc. (Continued)

95,000 cu.yd. Slips 230 and 232, Terminal Island; 454,700 cu.yd. West Basin-Wilmington Dist., Spec. 953, P.W.A. project. $100,000. A. Eldridge, City Hall, gen. mgr.

La., New Orleans—Mar. 16, by Bd. State Engineers, excavation of 400,000 cu.yd. in Vidalia Point Canal, in Fifth Louisiana Levee Dist., in Concordia Parish.

N. Y., Hornell—See "Contracts Awarded."

N. Y., Utica—See "Contracts Awarded."

B. C., Steveston—Mar. 13, by Secretary Dpt. P. Wks., Ottawa, Ont., constructing Albion Island Dyke No. 2 and Woodwards Training Wall extension, Fraser River, New Westminster Dist., involving 127,000 lin.ft. fir piling, 96,500 ft. B.M. waling and scabs, 49,000 ft. B.M. planking and 10,500 tons rock in place. $145,000. K. M. Cameron, Ottawa, Ont., engr. Noted Oct. 21, C. D.

CONTRACTS AWARDED

†**Md., Annapolis**—Yards & Docks, Navy Dpt., Wash., D. C., shore protection at Naval Academy, Spec. 7947, to Boudin Contg. Co., 105 West 40th St., New York, N. Y., $49,270 (180 days). Bids Jan. 29. Noted Feb. 24, C. D.—Dec. 26, E. N.-R.

Md., Baltimore—City, City Hall, dredging on west side, Pier 1, Pratt St., and maintenance dredging in Baltimore Harbor, to Arundel Corp., Pier 2, Pratt St., Baltimore, $28,840. Bids Feb. 12.

N. Y., Hornell—City, City Hall, constructing walls and dikes on Canacadea and Crosby Creeks, Canisteo River, Chauncey Run and Spencer Run, relief labor. $70,000. $20,000 additional W.P.A. funds allotted.

N. Y., Utica — City, City Hall, improving Starch Factory Creek, in 13th Ward, incl. replacing 1,800 sq.yd. rip rap wall, reconstructing 1,450 lin.ft. rip rap wall, removing 7,000 cu. yd. gravel from creek, relief labor. $35,000. **W.P.A.** D. Mahoney, Hotel St., Utica, Procurement Officer W.P.A., will purchase materials and rent necessary equipment.

†**Tex., Galveston**—U. S. Eng., Galveston, dredging Brazos Island Harbor, Stas. 14 and 200 to 15 and 150, to Atlantic, Gulf & Pacific Co., 15 Park Row, New York, N. Y., $18,001. Bids Feb. 14. Noted Jan. 27, C. D.—Jan. 30, E. N.-R.

†**Tex., Port Aransas**—U. S. Eng., Galveston, tentatively awarded contract dredging 369,000 cu.yd. from inner basin of western end Port Aransas Harbor, to Atlantic, Gulf & Pacific Dredging Co., Galveston, at 15.98c. per yd., total $74,946. Noted Jan. 22, C. D.—Jan. 30, E. N.-R.

UNCLASSIFIED

PROPOSED WORK

★ **Connecticut** — TELEPHONE SYSTEM IMPROVEMENTS — Southern New England Telephone Co., 55 Trumbull St., Hartford, plans improvements to telephone system, various locations. $3,450,000 budget for 1936.

Conn., New Haven—SERVICE MAINS, etc.—See "Industrial Buildings."

★ **Conn., Stevenson** — TURBINE, etc. — Connecticut Light & Power Co., R. H. Knowlton, vice-pres., 155 High St., Hartford, appropriated funds for 8,200 kw. turbine at Stevenson Dam Power Plant, also 25,000 kw. turbo-generator at Montville. Transmission line extensions during year will take expenditure of $3,300,000 with this equipment.

Massachusetts—TELEPHONE TOLL LINE—See "Contracts Awarded."

Mass., Stoneham—TRAFFIC SIGNALS, etc.—Town, H. R. Dockam, chn., Bd. Selectmen, plans election in March, to vote on constructing traffic signals at Main and Hancock Sts.; cruising auto and motorcycle equipped with radio for Police Dept.; teletypewriter for Police Dept.; reconstructing fire alarm system; air compressor for P. Wks. Dpt.; repairing Armory Hall.

★ **Michigan and Indiana**—GAS PIPE LINE—Columbus Gas & Electric Corp., 61 Bway., New York, plans being completed for 300 mi. 20, 22 or 29 in. steel pipe line to connect Detroit City Gas Company's distribution system to the natural gas pipe line of the Panhandle Eastern Pipe Line Co. Extension to be financed entirely by the Panhandle Co. $18,000,000. Private plans. Contract between the gas company to bring natural gas to Detroit has been approved by Detroit City Council.

★ **Missouri**—RAILROAD—J. M. Furn & J. G. Lansdale, federal trustees for St. Louis-San Francisco Ry., F. G. Jonah, ch. engr., 902 Olive St., St. Louis, announced following construction during 1936: new rail and other track materials $750,387, mechanical department $406,494, bridges, trestle and culverts $298,048, signal and interlockers $137,991, widening cuts and fills $104,217. Federal Court asked to approve budget. Also contemplates laying 100 mi. new 112 lb. rail to replace lighter rail.

New York — SUBWAY STRUCTURE — Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, rejected bids No. 22, reconstructing structure at Schermerhorn and Hoyt Sts., Brooklyn, for Independent City-Owned Rapid Transit R.R., Agreement NJ. Project abandoned. Noted Nov. 25, C. D.

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O., Cincinnati — TELEPHONE LINES — "Commercial Buildings."

Wash., Pullman—STADIUM GRANDSTAN Washington State College rejected bids Feb constructing stadium grandstand, $110 Specifications to be revised and will readver S. A. Smith, Pullman, archt. Noted Feb C. D.

BIDS ASKED

D. C., Wash.—RAILROADS—See "Contr Awarded."

Ill., East St. Louis—PARK—See "Contr Awarded."

N. Y., Auburn—STADIUM—Mar. 17, by Educ., City Hall, constructing seating st ture for Auburn High School Stadium, Fr lin St. $48,100. P.W.A. and W.P.A. pro Noted Feb. 11, C. D.—Feb. 20, E. N.-R., u "Contracts Awarded."

N. Y., Brooklyn—RECREATION BUILD etc.—See "Contracts Awarded."

N. Y., New York—COMFORT STATION See "Contracts Awarded."

N. Y., Niagara Falls—CONDUIT LINE— "Contracts Awarded."

N. Y., Schenectady—PARK DEVELOPMENT —See "Contracts Awarded."

Pa., Johnsonburg—PARK DEVELOPMEN See "Contracts Awarded."

Pa., Sunbury — AIRPORT — See "Contr Awarded."

Tex., San Antonio—AIRPORT—See "Contr Awarded."

†**T. H., Pearl Harbor**—QUAY WALL—M 25, by Yards & Docks, Navy Dpt., Wash., D constructing quay wall, Spec. 8014.

CONTRACTS AWARDED

Calif., Oakland — WHARF EXTENSION — A. W. Kitchen, general contractors, 110 Market St., San Francisco, dredging for wharf extension to Pacific Bridge Co., foot of Derby St., for City Port Comn.•••rip rap rock, to Daniel Contg. Co., 503 Market St., San Francisco••• reinforcing steel, to Soule Steel Co., 1750 Army St. and Judson-Pacific Mfg. Co., 609 Mission St., San Francisco•••concrete, to Transit Concrete Co., 2500 Peralta St.•••lumber and piling, to McCormick Co., 461 Market St., San Francisco. Noted Jan. 3, C. D.—Jan. 9, E. N.-R., under "Contracts Awarded."

Calif., Sacramento—SWIMMING POOL, etc.—City Council, constructing 65x165 ft., rein.-con. swimming pool and clubhouse, to H. W. Robertson, 3004 "F" St., $136,100. Est. exceeds $75,000. Bids about Feb. 13, awarded Feb. 21, Noted Feb. 21, C. D.—Jan. 230, E. N.-R.

★ **D. C., Wash.** — RAILROADS — Capitol Transit Co., car track renewals and replacements, $600,000, and track changes to permit rerouting $967,000, day labor. Owner will purchase materials.

★ **Ill., East St. Louis**—PARK—East St. Louis Park Dist., 929 Missouri Ave., rehabilitation of 12 public parks, incl. grading, football fields and tennis courts, clearing willows and shrubbery from 90 acre island to provide picnic grounds and clearing, grading shores of minor lakes and boat basin in Lake Park, clearing weeds and brush, repairing walks and drives in 11 other parks, and constructing 3 mi. bituminous road and system of 9.5 mi. bridle path and gravel walks in Lake Park, relief labor, under supervision of E. F. Griffin, supt. $856,475. **W.P.A.**

Massachusetts—TELEPHONE TOLL LINE — New England Telephone & Telegraph Co., J. H. Weinheimer, dist. mgr., 33 Elm St., Worcester, 24 mi. telephone toll line from Worcester to Fitchburg, day labor. Est. about $250,000. Work started.

†**Mississippi**—POWER LINES—Rural Electrification Administration, constructing 55.3 mi. power lines in Tennessee Valley Area, Monroe Co., to R. H. Bouligny, Inc., Charlotte, N. C., $66,741.

N. J., Elberon—BATHING PAVILION—Elberon Bathing Corp, constructing bathing pavilion, Contr. 1, bathhouses, cabanas, carpentry to Pope & Cottle, 515 Madison Ave., New York, $15,000 plus; Contr. 2, swimming pool, equipment, to Hasbrouck Co., 101 Park Ave., New York, $14,000 plus. Est. $36,000. N. Myers, 24 Walnut St., Newark, archt.

New York—TUNNEL—G. A. Brewster & Co., general contractors, 111 West 42nd St., New York, 1,500 tons structural steel for New Jersey approach to Midtown Tunnel, for Port of New York Authority, 111 8th Ave., New York, to Phoenix Bridge Co., Phoenixville, Pa. Noted Jan. 24, C. D.—Jan. 30, E. N.-R.

N. Y., Brooklyn—LIGHTING EQUIPMENT—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing station and tunnel lighting equipment for Independent System, Fulton St. and Metropolitan Ave. Stations to Jandous Electric Equipment Co., 109 West 31st St., New York, $178,400. **P.W.A.** Bids Dec. 27. Noted Dec. 11, C. D.—Dec. 19, E. N.-R.

N. Y., Brooklyn—RECREATION BUILDING, etc.—Dpt. Parks, Arsenal Bldg., Central Park, New York, constructing recreation building and comfort station, Smith St., Carroll and President Sts., by day labor. **W.P.A.** Est. about $37,000. A. Embury, 2nd., c/o owner, archt. Owner now purchasing materials.

†*Federal Government.*

Unclassified (Continued)

N. Y., New York—COMFORT STATION—Dpt. Parks, Arsenal Bldg., Central Park, 1 story, brick comfort station, Central Park, opposite 65th St., day labor. **W.P.A.** Est. about $23,000. Owner awarding material contracts.

★ **N. Y., New York** — PIER SHED — Dpt. Docks, Pier A, foot Battery Pl., New York, enclosure for shed on pier 90, West 50th St., North River, to O'Driscoll & Grove, 247 Park Ave., $162,100***sprinkled, to Raisler Sprinkler Co., 120 Amsterdam Ave. $35,147***heating, to J. L. Murphy, Inc., 340 East 44th St., $58,000***plumbing, to K. McCullagh, Inc., 429 East 44th St., $89,500***painting to J. I. Hass Co., 51 East 42nd St., $8,340***electrical work, to C. F. Zweifel & Co., 114 East 32nd St., $111,880***elevator, to A. B. See Elevator Co., 419 4th Ave., $88,345*** stairs, to Westinghouse Electric Elevator Co., 30 Rockefeller Plaza, $28,678***baggage conveyors, to Robinson Branin Co., Inc., 90 West Bway., $10,800 ***incinerator, to Sanitation & Engineers Constructors, 247 Park Ave., $6,100. Grand total $598,890. Bids Jan 23. Noted Jan. 24, C.D.

N. Y., Niagara Falls—CONDUIT LINE—City, City Hall, installing 8,600 lin.ft. underground conduit line in Pine Ave. from Packard Rd. to 73rd St., for fire and police alarm system, relief labor. $25,000. **W.P.A.** E. Noonan, Bailey Bldg., Lockport, procurement officer W.P.A., will purchase materials.

N. Y., Schenectady—PARK DEVELOPMENT—Bd. Supervs. Schenectady Co., developing Pleasant Valley Park, incl. constructing earth dam, concrete spillway, cribbing, foot bridge, culverts, path, railings, park roads, clean and deepening creek, fill washouts and cut timber, relief labor. $180,000. **W.P.A.** J. W. Carroll, Old Post Office Bldg., Albany, Procurement Officer W.P.A., will furnish materials.

Pa., Johnsonburg—PARK DEVELOPMENT—Comrs. Elk Co., developing Bendigo Community Park in East Branch Valley, incl. foot bridges, roads, grading, ball diamond, tennis courts, camp buildings, administration building, bath houses, auditorium, etc., relief labor. $100,000. **Maturity in spring.** C. Keelor Gifford, Johnsonburg, co. engr.

Pa., Sunbury — AIRPORT — City, City Hall, improving municipal airport, incl. hangars, runways, lighting system, administration building, day labor. Est. $82,500. **W.P.A.**

Texas—PIPE LINE—Crude Oil Pipe Line Co., San Diego and Corpus Christi, surveys and purchasing of right-of-way for (2nd unit), 50 mi. 5½ in. welded pipe line starting at Govt. Wells Dist., Duval Co. to Corpus Christi. First unit for 25 mi. pipe line from Loma Novia to San Diego, completed. N. A. Saigh Constr. Co., c/o Builders Exchange Bldg., San Antonio, has been given contract to construct all phases of project.

Tex., San Antonio—AIRPORT—City, C. K. Quin, mayor, Winburn, flying field improvements, incl. drainage, leveling of airdrome, extending runways, installing new lighting system, administration building, shop enlargement, W.P.A. labor. $86,700. I. Ewig, city engr. Noted Dec. 2, C. D.—Dec. 5, E. N.-R.

Alta., Calgary—GAS—Canadian Western Natural Gas Co., 6th Ave., W., are leasing 23,000 acres near here and 16,000 acres near Edmonton, and will do extensive drilling. Owner builds. **Maturity about Apr. 1.**

Ont., Ottawa—HANGAR—Royal Canadian Air Force, Rockcliffe, supply and erection of structural steel for Landplane Hangar No. 1, Rockcliffe, to Dominion Bridge Co. Ltd., Sparks St. Est. $30,000.

†**Virgin Islands**—AVIATION FACILITIES—Yards & Docks, Navy Dpt., Wash., D. C., aviation facilities, Spec. 8127, to W. P. Thurston, 4th and Byrd Sts., Richmond, Va., Items 2b, 5b, 6b, 7b, 8b and 9b, $260,000 (300 days). Noted Jan. 28, C. D.—Dec. 26, E. N.-R.

MATERIALS AND EQUIPMENT

PROPOSED WORK

CEMENT, etc.—Martinez, Calif.—J. H. Morrow, purch. agt. Contra Costa Co., plans purchasing cement, sand, rock, reinforcing steel, wire netting, etc., in connection with vault work and remodeling of court house basement for county offices. To exceed $1,000.

MOTOR GRADER, etc.—Oakland, Calif.—W. W. Chappell, city clk., rejected bids Jan. 23, furnishing 4 wheel tandem drive motor grader; also for 3 wheel gasoline roller for Street Dpt. Will readvertise. Noted Jan. 17, C. D.

FIRE FIGHTING EQUIPMENT—Stockton, Calif.—City, defeated $50,000 bonds to finance purchase of fire fighting equipment, motor apparatus, etc. Noted Jan. 14, C.D.—Jan. 16, E.N.-R.

CABLE—Chicago, Ill.—Sanitary Dist. of Chicago, rejected bids Feb. 6, two 450-ft. lengths, 500,000 circular mil, 3 conductor lead-covered, sextor cable, paper insulated. Noted Feb. 17, C. D.

TRUCK TRACTOR, etc. — Athol, Mass. — Town, J. G. Cotton, supt. Streets, Town Hall, soon takes bids furnishing truck tractor and snow equipment. $7,000 appropriated.

FIRE ALARM EQUIPMENT, etc.—Greenfield, Mass. — Town, Fire Station Comn., bids in March for furnishing electrical fire alarm equipment for new fire station, also lighting fixtures. Est. $15,000. J. A. Britton, 78 Federal St., engr.

RAILS—**Missouri**—See "Unclassified."

BIDS ASKED

MOTOR GENERATOR SET—Los Angeles, Calif.—Mar. 18, by D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., furnishing one 300 kw., 550 V.D.C. motor generator set for operation on 5,000 V., 60 cycle, 3 phase source, f.o.b. Los Angeles, one set as above so designed that at future date motor windings may be connected for operation, at 2,300 V., 60 cycles and generator may be converted at minimum cost into 250 V.D.C., alternate A, one set as above designed solely for use without anticipated changes, alternate B, one used motor generator set suitable for operation from 5,000 V., 60 cycle, 3 phase source and capable of delivering approximately 300 kw. D.C., 525 to 575 volts. Spec. 1885. To exceed $2,000.

TRANSFORMERS — Pasadena, Calif. — Mar. 18, by Clerk, City Dpt. Power & Light, City Hall, 2 transformers rated 9,000 kva., self-cooled, 12,000 kva., auxiliary air blast, 3 phase, 60 cycle, 33,500/16,500 v. $30,000. F. De Lanty, power supt.

WASHED GRAVEL, etc.—Chicago, Ill.—Mar. 11, by City, City Hall, furnishing, delivering washed gravel and torpedo sand by truck and rail as ordered by Bureau of Engineering over period ending Dec. 31, 1936. $25,000. O. E. Hewitt, city engr.

ALUMINUM SULPHATE—Evansville, Ind.—Mar. 12, by Water Works Trustees, J. W. Heynes, clk., 500 tons aluminum sulphate, ground granulated form for water purification.

CONCRETE PIPE, etc.—Cherokee, Ia.—Mar. 10, by Cherokee Co., H. M. Montgomery, aud., 2,402 lin.ft. concrete pipe; 50,000 ft. BM. plain and treated lumber; 25 lin.ft. treated piling; 1 car corrugated pipe. W. H. Hosmer, co. engr.

LUMBER, etc.—Davenport, Ia.—Mar. 10, by Scott Co., A. O. Kurth, aud., 97,000 ft. B.M., Class D, 3,216 ft. Class C and 72,866 ft. B.M. creosoted lumber; 1,980 lin.ft. creosoted piling. J. M. Malloy, co. engr.

CASTINGS, etc.—Springfield, Mass.—Mar. 10, by City, C. W. Phillips, supt. Dpt. Streets & Engineering, Administration Bldg., castings, vitr. clay sewer pipe, fine and coarse asphalt sand, asphaltic cement, penetration asphalt, trap rock, washed sand for concrete, washed gravel, portland cement, sewer brick, part of P.W.A. Project 1242.

TRUCKS—Buffalo, Minn.—Mar. 11, by E. R. Anderson, aud. Wright Co., furnishing one to seven 1½ ton trucks, short wheel base with cabs, etc.

TRUCK, etc.—Center City, Minn.—Mar. 18 by A. F. L. Stromgren, aud. Chisago Co., furnishing one 1½ ton truck with hydraulic hoist and body drop side; also season's supply of portable culverts.

TRUCK, etc.—Fergus Falls, Minn.—Mar. 12, by W. Lincoln, aud., Otter Tail Co., one 1½ ton truck with cab, 1 motor patrol grader with snow plow, equipment, and season's supply of corrugated pure iron pipe and concrete pipe for culverts.

GRADER — Gaylord, Minn. — Mar. 10 (extended date), by W. C. Oldenburg, aud. Sibley Co., 1 motor grader with 14 ft. mold board. Noted Jan. 29, C. D.—Feb. 6, E. N.-R.

BLADE GRADERS — Hastings, Minn. — Mar. 16, by Dakota Co., N. H. Marshall, aud., furnishing 2 pull-type blade graders with 14 ft. blades, about 6,000 lb. to be used behind 5 ton trucks, also 876 ft. 15- to 36-in. corrugated metal culvert to be delivered near Castle Rock.

POWER PLANT MACHINERY and EQUIPMENT—Bolivar, N. Y.—Runyan & Reynolds Oil Co., in market for machinery and equipment for power plant, incl. gas engine, well pumping power, wrenches, drills and other small tools.

†**CABLE—Brooklyn, N. Y.**—Mar. 20, by Signal Corps Procurement Dist., Army Base, 58th St. and 1st Ave., 600,000 ft. cable (60 reels).

TRUCK — Cherry Creek, N. Y. — D. Dewey, Cherry Creek, taking bids 1½ or 2 ton highway truck to be equipped with flat body for hauling materials. $2,000.

STEEL RAIL, etc.—New York, N. Y.—Mar. 10, by Bd. Transportation, J. H. Delaney, chn., 240 Hudson St., New York, open hearth steel rail and carbon brushes for Independent city-owned Rapid Transit R.R.

MOTOR TRUCK CAR WHEELS—New York, N. Y.—Mar. 11, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing and delivering solid steel motor truck car wheels for Independent City-owned Rapid Transit R.R. System.

PAINT — Cleveland, O. — Mar. 10, by Bd. Comrs. Cuyahoga Co., G. H. Stahler, clk., 1,200 gal. white traffic paint.

†**SWITCHGEAR—Portland, Ore.**—U. S. Eng., Custom House, in market for 2,400 volt metal clad switchgear. Alternate A f.o.b. factory, or Alternate B f.o.b. job for Bonneville Dam.

CEMENT, etc.—Scranton, Pa.—Mar. 18, by City Controller, 285 tons asphalt cement, 270 tons limestone dust, 2,145 tons asphalt sand.

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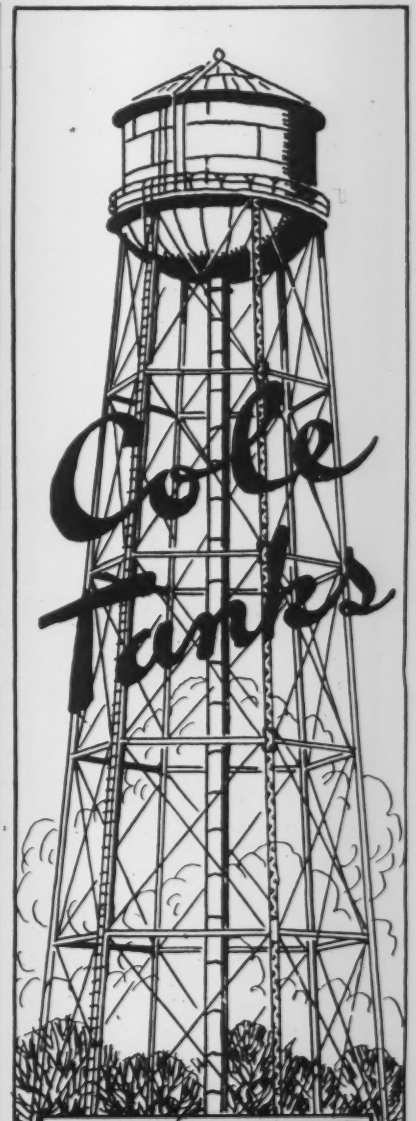
†*Federal Government.*



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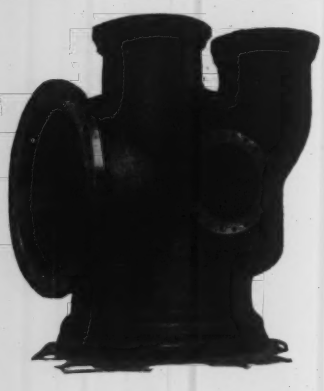

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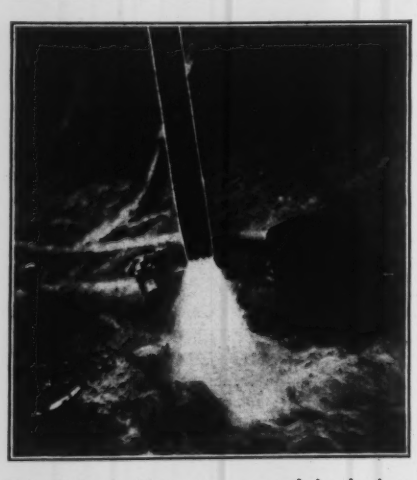

Duo-Valved—No water wasted in jetting and the steel toothed tip cuts hard material out of the way.

A contractor who knew, wrote in—"Your points continued to produce results and did not clog during our operations." Note that word "clog"—its twin brother's name is Red Ink.

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MORETRENCH CORPORATION

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Materials, etc. (Continued)

16,000 gal. fuel oil, f.o.b. municipal asphalt plant. To exceed $1,000. C. F. Schroeder, city engr.

LIME, etc. — **Winterset, Pa.** — Mar. 16, by Directors Poor Cambria Co., Ebensburg, 50 tons hydrated lime, 4 tons ammonia sulphate, 26 tons fertilizer. To exceed $1,000.

†TRANSMISSION TOWERS—**Knoxville, Tenn.** —Mar. 13, by Tennessee Valley Authority, furnishing, fabricating, galvanizing, selling and delivering 298 single circuit steel transmission towers. C. H. Garity, dir. Purchases.

PIPE—**Oakville, Ont.**—Municipality in market for 400 ft. 6 in., and 700 ft. 12 in. watermains. R. F. Smith, Town Hall, engr.

METERS—**Paris, Ont.**—Municipality in market for ammeter, 6,400 amp., and 3 water meters. H. Richards, town engr.

FIRE ALARM BOXES, etc.—**Sarnia, Ont.**—Municipality, M. D. Stewart, city clk., in market for fire alarm boxes, hydrants, boiler for pumping station, hose and ladder truck and 6 in. water pipe. A. Smith, Town Hall, engr.

CONTRACTS AWARDED

TURBINE PUMP—**Beverly Hills, Calif.**—City Clerk, one deep well turbine pump in accordance with specifications on file with engineers, to Byron Jackson Co., 2150 East Slauson Ave., Huntington Park, $1,765. Bids Feb. 4, awarded Feb. 18. Noted Jan. 31, C. D.

RE-LAY TRACK MATERIAL—**Long Beach, Calif.**—R. M. Dorton, city mgr., furnishing relay track material, 597.3019 gross tons, 7 in.-128 lb. grooved girder rail; 60 continuous joints, 128 lb.; 12,705 tie plates for above rail; 5,302 brace tie plates for above rail, Spec. R-887, to Pacific Electric Railway Co., 601 South Main St., Los Angeles, $31,659. Bids Feb. 5. Noted Feb. 14, C. D.

SWITCH MATERIAL—**Long Beach, Calif.**—City Council, furnishing railroad switch material, three 100 ft. radius, 128 lb. manganese switches complete, one 150 ft. radius same, four 128 lb. manganese No. 7, frogs (rigid), eight 1 in. x 6 in. x 7 in. flat frog guard rails complete and four ground throw switch boxes, Spec. R-877, to Racor Pacific Frog & Switch Co., 3355 East Slauson Ave., Los Angeles, $4,200. Bids Jan. 29.

DUMP TRUCK SERVICES—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt., Dpt. Water & Power, 207 South Broadway, dump truck services for period of 10 months, Spec. X-19, to Brown & Camillo Trucking Co., 424 Fernando Court, Glendale, $60,000. Bids Feb. 24, awarded Feb. 25. Noted Feb. 20, C.D.

†PIPE—**Los Angeles, Calif.**—U. S. Eng., 4,300 ft. 1- to 2-in. steel welded standard black pipe, Lot 1 to Santa Fe Pipe & Supply Co., 2451 East 15th St., $534***4,500 ft. ½- to 1-in. pipe, Lot 2, to Robert M. Hartwell Co., 353 East 2nd St., $3,381***14,000 ft. 3/4- to 3-in. pipe and fittings, Lot 3, to Pennsylvania Iron & Steel Co., 2308 Santa Fe Ave., $2,364. Grand total $3,278. Bids Feb. 17. Noted Feb. 13, C.D.

†PORTLAND CEMENT—**Los Angeles, Calif.** —U. S. Indian Irrigation, 751 South Figueroa St., 5,100 bbl. Portland cement, f.o.b. cars Elko, Nev., to Pacific Portland Cement Co., 111 Sutter St., San Francisco, $15,857. Bids Feb. 12, awarded Feb. 19. Noted Feb. 6, C. D.

STRUCTURAL STEEL I-BEAM RIBS—**Los Angeles, Calif.** — Directors Metropolitan Water Dist., 306 West 3rd St., F. E. Weymouth, engr., furnishing structural steel I-beam ribs with appurtenant splice plates, base plates, bolts and nuts for support of 10 ft. diam. tunnels, Spec. 146, Colorado River Aqueduct Project, to Bethlehem Steel Co., East Slauson Ave., Veron, $10,132, f.o.b. Los Angeles. Bids Feb. 17. Noted Feb. 24, C.D.

†TAMPING ROLLERS—**Los Angeles, Calif.** —U. S. Eng., 751 South Figueroa St., 2 tamping rollers, Proposal 465, to Southwest Welding & Mfg. Co., 3201 West Mission St., Alhambra, $1,196.

TELESCOPING STEEL FORMS—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., 300 ft. movable telescoping steel forms for lining 16 ft. tunnel, Spec. 144, to Lakeside Bridge & Steel Co., 3200 West Villard Ave., Milwaukee, Wis., $21,720. Bids Feb. 11. Noted Feb. 20, C. D.

TUNNEL TIMBER—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., S. A. Joseph, purch. agt., furnishing 150,000 bd. ft. tunnel timber, Bid 53630, to Daugherty Lumber Co., Portland, Ore., $1,735; steel arch ribs for tunnel support, Bid 53793, to Consolidated Steel Co., 6500 East Slauson St., $6,159, all for Colorado River Aqueduct. Awarded Feb. 19.

TUNNEL TIMBER—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., S. A. Joseph, purch. agt., furnishing 200,000 bd. ft. tunnel timber, f.o.b. mill, for Colorado River Aqueduct, Bid No. 53630, to McCormick Supply Co., 714 West Olympic Blvd., $2,685. Awarded Feb. 20.

VIBRATING SCREEN—**Los Angeles, Calif.**—A. J. Holm, city purch. agt., City Hall, one horizontal vibrating screen, 48 in. x 12 ft. double deck, Symons Bros. or equal for city asphalt plant, Spec. 3467, to Madsen Iron Wks., 5631 Bickett St., Huntington Park, $2,844. Bids Feb. 11, awarded Feb. 19. Noted Feb. 20, C. D.

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STOPS—**Oakland, Calif.**—J. H. Kimball, ... East Bay Municipal Utility Dist., 512 16th ... to American Brass & Copper Co., 557 Mar... St., San Francisco, furnishing 250 one in. ser... stops $105; 250 one in. corporation stops $1... 5,000 three-quarter inch same $2,345; 7... three-quarter inch service stops $2,288***... James Jones Co., 201 Leroy St., Los Ang... one hundred 2 in. corporation stops, $475*... to Mueller Co., 1072 Howard St., San F... cisco, 100 one and one-half inch corporat... stops, $280. Grand total $5,661. Bids Feb. ...

ASPHALTIC EMULSIONS—**Sacramento, Cal...** —H. G. Denton, city clk., 72,000 gal. asphal... emulsions for use in sealing and repair of ... streets, to A. Teichert & Son, P. O. Box 11... 6.66c. per gal. city truck, and 11.25c. per g... steel drum. Bids Jan. 23. Noted Jan. 17, C. ...

TRUCKS — **Bridgeport, Conn.** — Public P... chases Dpt., 172 State St., furnishing four... 4 cylinder, chain-drive, open cab type tru... chassis, to Mack Motor Truck Co., 3250 F... field Ave., $49,140. Bids Feb. 17, awar... Feb. 21. Noted Feb. 14, C. D.

BRACKET COVERINGS—**Chicago, Ill.**—C... City Hall, furnishing, delivering 200 alumin... bracket fixtures, to Leitelt Bros., 7731 So... Chicago Ave., $2,780. Bids Feb. 6, awarde... Feb. 21. Noted Feb. 11, C. D.—Jan. ... E. N.-R.

DISC FILMS, etc. — **Chicago, Ill.** — Dpt. ... Wks., City Hall, furnishing, delivering 100,0... disc films, to Westinghouse Electric & Mfg. ... 20 North Wacker Dr., $2,920; 5,000 l... sockets, to Exchange Electric Supply Co., 6... West Washington St., $3,000. Bids Dec. ... Noted Dec. 27, C. D.

FACE BRICK—**Chicago, Ill.**—City, City Hall, ... 92,000 colonial face brick, to Consolidated C... 111 West Washington St., $2,760. Bids Feb. ... awarded Feb. 21.

LIQUID CHLORINE — **Chicago, Ill.** — City, ... City Hall, 950,000 lb. in 100 lb. cylinders, ... liquid chlorine, to Hooker Electrochemical C... $51,870; 800,000 lb. liquid chlorine in 1 to... containers, to Pennsylvania Salt Mfg. Co., 29... North Wacker Dr., $21,120. Bids Feb. 21.

LOCKS—**Chicago, Ill.**—City, City Hall, fur... nishing, delivering at site 1 set of 2 complete... center locks for Grand Ave. Bridge, to Dreher... Co., 11 West Washington St., $4,907. Bids ... Feb. 3, awarded Feb. 20. Noted Feb. 17, C. D.

STORAGE TANKS—**Hammond, Ind.**—Lever ... Bros., storage tanks containing 1,100 tons ... steel, to Hamler Boiler & Tank Co., 6025 West ... 6th St., Chicago, Ill.

TRACTORS, etc.—**Iowa**—State Hy. Comm., ... Ames, 1 track type tractor and 11 motor graders, ... to Gibbs-Cook Tractor & Equipment Co., Des ... Moines, $3,919 and $33,342 respectively***3 ... track type tractors and 2 motor graders, to ... H. M. Brown, 212 12th St., Des Moines, $13,998 ... and $6,906 respectively***2,000 gal. white guard ... rail paint, to J. H. Witte & Sons, Burlington, ... $2,740***107,231 gal. black centerline paint, ... to Wheeler Lumber & Bridge Supply Co., 606 ... Hubbell Bldg., Des Moines, $18,307***6 blade ... and 5 motor graders, to Waterloo Constr. Co., ... Waterloo, $8,883 and $14,597 respectively*** ... season's supply of oxygen and acetylene, to ... Linde Air Products Co., 532 Southwest 7th St., ... Des Moines, $2,240***2 motor graders, to Duplex Mfg. Co., 21st and Locust Sts. E., Omaha, ... Neb., $5,370***4 motor graders, to J. D. Adams, ... 217 South Belmont Ave., Indianapolis, Ind., ... $14,528***7 motor graders, to Royer Mfg. Co., ... Janesville, $21,067***4 motor graders, to Austin Western Mfg. Co., 721 Cherry St., Des ... Moines, $12,570***2 motor graders, to Gierke ... Robinson Co., Davenport, $6,680. Grand total ... $165,147. Bids Feb. 17, awarded Feb. 2. Noted ... Feb. 11, C.D.

BRIDGE LUMBER—**Mason City, Ia.**—Cerro ... Gordo Co., A. Harris, aud., 33,600 ft. BM Class ... D Douglas fir bridge lumber, to Frudden Bridge ... Lumber & Supply Co., Greene, $1,406. Bids ... Feb 24. Noted Feb. 18, C. D.

†ELECTRICAL SUPPLIES, etc.—**Eastport, Me.**—U. S. Eng., electrical supplies for Passamaquoddy Project, to R. Pill Electric Supply Co., 95 Stamfort St., Boston, Mass.***one 90 hp. diesel crawler tractor, to Eastern Tractor & Equipment Co., 35 Allen St., Portland, $8,933 *** one 2¼ yd. crawler mounted power shovel, to Harnischfeger Sales Corp., 4400 West National Ave., Milwaukee, Wis., $39,050***three 3 kva. distribution transformers, to Line Material Co., South Milwaukee, Wis., $49 each*** 4 rock drills, to Bichnell Mfg. Co., Rockland ***millwork for hospital, to Matthews Bros., Belfast***3,000 bbl. high early strength cement, to Lone Star Cement Co., 75 State St., Albany, N. Y.; and 2,000 bbl., to Lawrence Portland Cement Co., 270 Bway., New York. Bids Feb. 7, 6, 8 and 10. Noted Feb. 3, 7 and 13, C.D.—Feb. 6, E.N.-R.

WROUGHT IRON PIPE—**Lynn, Mass.**—City, ... 15,000 ft. 1¼ in., 1,500 ft. 1½ in., 3,500 ft ... 2 in. and 500 ft. 3 in. diam., 14- to 16-ft ... lengths, wrought iron pipe, to Boston Pipe & ... Fittings Co., 149 Sidney St., Cambridge. Bids ... Feb. 4. Noted Jan. 27, C. D.—Jan. 30, E. N.-R.

PIG LEAD—**Baltimore, Md.**—City, furnishing, ... delivering pig lead to Bureau Water Supply, to ... Federated Metals Corp., Highland and East ... Bourne Aves., $4,610. Bids Feb. 12. Noted ... Feb. 19, C. D.—Feb. 27, E. N.-R.

PIPE—**Baltimore, Md.**—City, furnishing, delivering 3 in. fibre pipe and 3 in. fibre bends

†*Federal Government.*

Materials, etc. (Continued)

to Bureau Mech. Electric Service, to Westinghouse Electric Co., Calvert and Lombard Sts., $2,955. Bids Feb. 12.

CASTINGS—Minneapolis, Minn.—City, 50 tons waterworks castings, to Crown Iron Wks. Co., 1229 Northeast Tyler St., $61.50 per ton. Bids Feb. 17. Noted Feb. 13, C.D.

†**REINFORCING BARS—Kansas City, Mo.**—U. S. Eng., 707 Postal Telegraph Bldg.; 1,500 tons steel reinforcing bars for emergency gate shafts for Fort Peck Tunnels, to Laclede Steel Co., Arcade Bldg., St. Louis, $55,442. Est. $60,000. Bids Feb. 11, awarded Feb. 20. Noted Feb. 20, C. D.

STEEL RAIL — St. Louis, Mo. — Missouri Pacific R.R., S. L. Wonson, ch. engr., Missouri Pacific Bldg., 5,000 tons steel rail, to Colorado Fuel & Iron Co., Pueblo. Est. $175,000.

†**REINFORCING BARS—Fort Peck, Mont.**—U. S. Eng., 7070 Postal Telegraph Bldg., Kansas City, 19,107,000 lb. steel reinforcing bars for Fort Peck Tunnels, f.o.b. Wiota, to Sheffield Steel Corp., Sheffield St., $324,879. Est. $333,000. Bids Feb. 21, awarded Feb. 24. Noted Feb. 14, C. D.

†**PIPE, etc. — Boulder City, Nev.** — Bureau Reclamation, Custom House, Denver, Colo., furnishing, delivering fabricated pipe, fittings, valves for headers on Arizona side of Boulder Power Plant, Boulder Canyon Project. Spec. 753-D. Item 1, to Greene-Wolf Co., Inc., 243 40th St., Brooklyn, N. Y., $415; Item 2, to Crane O'Fallon Co., 1631 15th St., Denver, Colo., $6,979. Bids Dec. 23. Noted Dec. 6, C. D.—Dec. 12, E. N.-R.

CEMENT—Cincinnati, O.—City, 39,800 bags cement, to A. F. Meyer Coal & Building Supply Co., 1233 Poplar St., $21,000. Awarded Feb. 25.

†**CEMENT, etc.—Ogden, Utah**—Bureau Reclamation, Denver, Colo., furnishing 20,000 bbl. Portland cement for Pine View Reservoir Dam, to Portland Cement Co., Salt Lake City, $38,800***30,000 bbl., to Union Portland Cement Co., 24 East 1st St. S., Denver, Colo., $61,620 ***sand and gravel for Pine View Reservoir Dam and high line canals, to Ora Bundy, Ogden, $26,660. Grand total $127,080. Bids Feb. 4.

GRADER—Kenosha, Wis.—City, H. C. Loughlin, mgr., power grader, to Milwaukee Power Equipment Co., 525 North 22nd St., Milwaukee. Bids Feb. 14.

†**GRAVEL, etc. — Milwaukee, Wis.** — Treas. Dpt., Wash., D. C., 1,500 cu.yd. gravel, to Berthelet P. & S. Co., 820 West Montana St., $1.30 per cu.yd.; steam pipe fittings and radiators, to F. R. Dengel Co., 1134 North 4th St. **W.P.A.** Awarded Feb. 20.

†**PIPE, etc.—Milwaukee, Wis.**—Treas. Dpt., Procurement Div., pipe and fittings for W.P.A. projects, to J. B. Clow Co., 201 North Talman Ave., Chicago, Ill., $759***pipe and fittings, to F. R. Dengel, 1134 North 4th St., $405*** 36,000 reclaimed common brick, to National Lumber & Wrecking Co., 1556 South 1st St., $10 per 1,000***7,500 ft. yellow pine, to North Side Lumber & Fuel Co., 1014 East Chambers St., $27 per 1,000***2,500 bd. ft. yellow pine, to Carl Muller Lumber Co., North 2nd and West Hampton Rd., $35 per 1,000***384 ft. 6 in. and 6,672 ft. 2 in. Class 150 c.i. pipe, to McWane Cast Iron Pipe Co., 1201 Vanderbilt Ave., Birmingham, Ala., 78c. and 22c. per ft. respectively.

CONCRETE PIPE—West Allis, Wis.—City, to Consumers Supply Co., 4135 West State St., Milwaukee, 30 ft. 12 in. concrete pipe at $41 per ft.; 100 ft. 2 in. at $.38 per ft.; 570 ft. 27 in. at $2.38 per ft.; 12 ft. 27 in. at $2.70 per ft. Bids Feb. 21.

PIPE, VALVES, etc.—Toronto, Ont.—City, City Hall, annual supplies for 1936, c.i. pipe, to National Iron Corp., Ltd., foot of Cherry St.***bronze check valves, to Dominion Wheel & Foundries, Ltd., 171 Eastern Ave.***vitr. sewer pipe, to Canada Vitrified Products, Ltd., Talbet St. E., St. Thomas***and to National Sewer Pipe Co., Ltd., Metropolitan Bldg.

FOREIGN

Australia—Government received bids for constructing oil production plant to treat coal and shale deposits, **Canharra**, from Imperial Chemicals Ltd., London, England, $30,000,000*** New South Wales Government sponsoring plant for producing oil from shale, **Newness**, $1,500,000.

Australia—W. B. Pilling of Eastern Prospecting Syndicate, Melbourne, announces purchase of 500 acres sea coast of New Britain, New Guinea, and plans developing high deposits of iron. To exceed $1,000,000. Will purchase modern machinery.

England—Gillette Safety Razor Co., 15 West 1st St., Bostor, Mass., constructing factory addition, separate contracts awarded. $1,000,000.

England—Mar. 13, by J. H. Broadley, secy. Water Dpt., Council House, **Birmingham**, constructing reservoir with mass concrete walls, rein.-con. floors, columns and roof, concrete valve chamber, masonry and brick valve house, excavations and embankments***Housing Comn. Urban Dist. Council, **Tipton**, plans 508 houses, $1,000,150***Derby Borough Survey prepares plans 500 houses on Roe Farm Estate, $1,110,000***Southend-on-Sea** Municipality voted $1,363,725 for municipal hospital.

†*Federal Government.*

PUBLIC BUILDINGS

PROPOSED WORK

★**Calif., Olive View**—Los Angeles Co., election May 5, $1,760,000 to finance part of cost of erecting proposed new hospital building at the Olive View Sanatorium. $3,300,000. W. R. Shonerd, Hall of Records Building, mechanical engr., preliminary plans for the structure have been prepared by the Los Angeles Co. Mechanical Department. Noted Sept. 27, C. D.—Oct. 3, E. N.-R.

†**Mass., Natick**—Treas. Dpt. at office Sup. Archt., Wash., D. C., bids early in March, constructing brick, stone U. S. Post Office, $95,000.

Mass., Walpole—Town, T. H. Bateson, chn. Building Comn., Town Hall, voted not to build for elementary school on Stone St. To exceed $150,000. W. G. Upham, 700 Washington St., Norwood, archt. Noted Jan. 9, C. D.—Jan. 16, E. N.-R.

Mass., Westwood—Town, W. H. Spokesfield, chn. Building Comn., Town Hall, construction of 2 story, basement Junior and Senior High School on High and Nahatan Sts., to be reconsidered at March Town Meeting. $200,000. P.W.A. project. Edwin Sherrill Dodge, 148 State St., Boston, archt. Noted Jan. 9, C. D.—Jan. 16, E. N.-R.

★**Minn., Bemidji** — City, Belle Denley, clk., defeated proposal to authorize construction municipal power plant, incl. central heating system, generating unit. $620,000. Burlingame & Hitchcock, 521 Sexton Bldg., Minneapolis, engrs. Noted Feb. 6, C. D.—Feb. 13, E. N.-R.

★**N. Y., Bath** — Vet. Bu., Arlington Bldg., Wash., D. C., bids about Mar. 1, 6 story, basement hospital. $600,000. Noted Apr. 18, C. D.—Apr. 25, E. N.-R.

★**R. I. Providence** — City, Public Buildings Dpt., City Hall, plans completed by I. S. Gorman, City Hall, 3 story, 2 story, basement, 240x285 ft., brick, steel, rein.-con., limestone high school, Hope St. $1,750,000. Bids after P.W.A. approval.

★**R. I., Providence**—City, Comn. of P. Bldgs., City Hall, plans completed by I. S. Gorman, city archt., for 3 story, basement, 240x287 ft., brick, steel, rein.-con. superstructure Senior High School, concrete found., Hope St. $1,500,000. P.W.A. project.

Tex., Anahuac — Chambers Co., c/o G. C. Jackson, judge, soon takes bids superstructure, 3 story, 74x150 ft., brick, steel, rein.-con. courthouse. Total est. $175,000. C. G. Curtis, 300 West 19th St., Austin, engr. Foundation work under way. P.W.A. project. Noted Dec. 9, C. D.—July 18, E. N.-R.

†**Va., Quantico**—Yards & Docks, Navy Dpt., Wash., D. C., bids postponed improving batchelor officers' quarters, Spec. 8080. New date not set.

★**Wis., Oshkosh**—Winnebago Co., J. F. Shea, chn. Building Comn., Pickett, Wis., plans by Auler, Jensen & Brown, Oshkosh, and K. M. Fitzthum & Son, Inc., assoc. archts., 1 North LaSalle St., Chicago, Ill., constructing court house. $800,000.

BIDS ASKED

†**Ala., Birmingham**—Mar. 16, by P. Wks. Administration, Div. Housing, Wash., D. C., constructing foundations for Smithfield Court Housing Project, Project H-2902. Noted Feb. 14, C. D.—Feb. 20, E. N.-R.

Ala., Dotham—Mar. 11, by Bd. Educ., Houston Co., Dotham, 8 additions and 4 new schools, brick and brick veneer. $170,000. P.W.A. project. C. H. McCauley, 705 Jackson Bldg., Birmingham, archt. Noted Feb. 27, C. D.

Calif., Alhambra—Mar. 16, by Bd. Educ., new school, to contain 18 classrooms and auditorium, Ramona School site. To exceed $140,000. P.W.A. project. J. W. Smart, 39 East Main St., archt. M. Erick, 811 West 7th St., Los Angeles, engr. Noted Feb. 24, C. D.—Feb. 27, E. N.-R.

D. C., Wash.—Mar. 17, by District Comrs., District Bldg., constructing certain additions (incl. all necessary remodeling), Anacostia Junior-Senior High School, 16th St. between Fairlawn Ave. and Ridge Pl.

†**Ill., Champaign**—Mar. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing, extending and remodeling U. S. Post Office. $175,000. Noted Feb. 4, C. D.—Feb. 6, E. N.-R.

†**Ill., Chicago**—Mar. 31, by P. Wks. Administration, Housing Div., Wash., D. C., constructing superstructures of Jane Addams Housing Project H-1405. Noted Jan. 2, C. D.—Jan. 9, E. N.-R.

Ill., Streator—Mar. 10, by Bd. Educ., D. N. Patterson, pres., constructing high school addition. P.W.A. project. L. H. Gerding, 708 LaSalle St., Ottawa, archt.

Mass., Lee—Mar. 12, by Town, Bd. Selectmen, Town Hall, brick, steel, marble high school addition. $140,000. M. W. Maloney, 220 Dwight St., Springfield. Bids Feb. 24 rejected. Noted Mar. 2, C. D.—Feb. 20, E. N.-R.

Mo., Jefferson City—Mar. 24, by Missouri State Penitentiary, Jefferson City, and Bi-Partisan Advisory Bd., State Capitol, Jefferson City.

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Public Buildings (Continued)

constructing 3 story, basement, 41x80 ft., rein.-con. administration building, 3 story, basement, 32x250 ft., rein.-con. dormitory, 2 story, basement, 60x85 ft. service building, incl. laundry, dining hall, kitchen, storage, dormitory and service building, connected with 1 story, basement, 16x150 ft. exercise corridor. $300,000. P.W.A. project. Klipstein & Rathmann, 316 North 8th St., St. Louis, archts. Noted Feb. 10, C. D.—Feb. 13, E. N.-R.

Mo., Neosho—Mar. 21, by Newton Co., C. E. Jeffrey, clk., constructing 3 story, basement, 90x112 ft., concrete, brick, stone court house. Est. about $200,000. P.W.A. project. N. C. Davis, 539 North and South Rd., University City, archt. Noted Jan. 8, C. D.—Jan. 16, E. N.-R.

N. M., Hot Springs—See "Contracts Awarded."

N. Y., Copenhagen—Mar. 20, by Bd. Educ., School Bldg., Copenhagen, general contract heating, ventilating, plumbing, electrical work for school for towns of Denmark, Harrisburg and Pinckney, Lewis Co. Champion and Rutland, Jefferson Co. $225,000. P.W.A. and W.P.A. projects. H. O. Fullerton, 152 Washington Ave., Albany, archt. $176,500. Noted Dec. 12, C. D.—Dec. 19, E. N.-R., under "Denmark, N. Y., Contracts Awarded."

★ **N. Y., East Rochester**—Union Free School Dist. 13, bids about Mar. 10, general contract, plumbing, heating, electrical work for school. $500,000. P.W.A. project. C. C. Ade, 52 James St., archt. Noted Dec. 2, C. D.—Dec. 5, E. N.-R.

N. Y., Glens Falls—Mar. 15, by Bd. Educ., Union Free School Dist. 1, constructing school. Tooker & Marsh, 101 Park Ave., New York, archts. Noted Feb. 18, C. D.—Feb. 20, E. N.-R.

†**N. Y., Rochester**—Mar. 13, by Treas. Dpt. at office Sup. Archt., Wash., D. C., remodeling passenger elevator in U. S. Court House, etc.

N. Y., Schenectady—Mar. 20, by Div. Military & Naval Affairs, Capitol Bldg., Albany, electrical work for 2 story, 147x231 ft. armory. Noted Feb. 18, C. D.—Feb. 20, E. N.-R.

†**N. Y., Troy** — Mar. 27, by Treas. Dpt. at office Sup. Archt., Wash., D. C., demolition and construction U. S. Post Office.

Pa., Meadville—Mar. 11, by Bd. Educ., 2 story, basement, 60x102 ft. and 68x113 ft. school and gymnasium addition. W. G. Eckles Co., New Castle, archt.

†**Tenn., Memphis**—Mar. 17, by Treas. Dpt. at office Sup. Archt., Wash., D. C., elevator in Ward Building at U. S. Marine Hospital.

Tex., Dallas — Mar. 17, by Highland Ind. School Dist., c/o R. C. Dunlap, pres., 3310 Normandy St., Senior High School, 2 story, basement, 177x250 ft., with 73x100 ft. and 93x100 ft. wings, brick, steel, rein.-con., plain found. $400,000. Dewitt & Washburn, 1013 Praetorian Bldg. Dallas, archts.

Tex., Fort Worth—Mar. 12, by City, c/o G. D. Fairtrace, mgr., memorial tower, 200 ft. high, 35x35 ft. base. $86,662; and Mar. 14, superstructure, general contract 209x232 ft., brick, concrete, steel, stone auditorium, plain found., $375,270, Centennial Grounds. Mechanical bids later. W. C. Hedrick, Inc., 1005 1st Natl. Bank Bldg., and E. G. Withers, Architectural Co., Holmes Bldg., archts.

†**Vt., Fort Ethan Allen**—Mar. 17, by U. S. Property & Disbursing Officer, State House, Montpelier, rebuilding officers' mess building on State Reservation.

LOW BIDDERS

†**D. C., Wash.**—Treas. Dpt. at office Sup. Archt., Wash., D. C., Feb. 26, metal stacks and filing equipment in new Archives Building, from Snead & Co., 96 Pine St., Jersey City, N. Y., Items (1) $1,385,900 (2) $684,000 (3) $740,000. Alternates (A) add $14,000 (B) add $630 (C) add $770. Noted Feb. 19, C. D.—Jan. 30, E. N.-R.

★ **Utah, Ogden**—City received proposals from A. C. Todd, Salt Lake City, for constructing municipal power plant, approximately $2,500,000; and from Fairbanks Morse & Co., Chicago, Ill., for Diesel-engined generation plant. C. Coray, city engr. Noted Jan. 30, C. D.

CONTRACTS AWARDED

Ariz., Tempe—Arizona State Teachers College, constructing 2 story, basement women's dormitory and combined stadium and industrial arts building, to D. E. Webb Constr. Co., 1633 West Jefferson St., Phoenix, $125,000 and $71,402 respectively. P.W.A. Noted Dec. 19 and Jan. 7, C. D.—Dec. 26, E. N.-R.

Calif., El Segundo—El Segundo School Dist., constructing elementary school, consisting of main building, 2 special rooms and assembly room, library, clinic and teachers' room, to Herbert M. Baruch Corp., 625 South Olive St., Los Angeles, $140,899. P.W.A. Noted Feb. 24, C. D.—Jan. 23, E. N.-R.

Calif., Reedley—Fisher & McNulty, general contractors, Cory Bldg., Fresno, plumbing and heating for Junior College, to F. Hudson, Fresno, for Reedley Joint Union High School Dist.*** sheet metal, to Barrett-Hicks Co., Fresno*** painting, to Schultz Paint & Wall Paper Co., Fresno***concrete work, to M. Madsen & Sons, Fresno***brick work, to P. Kindler, Fresno. P.W.A. Noted Jan. 6, C. D.—Jan. 9, E. N.-R., under "Contracts Awarded."

†**Calif., Salinas**—F. J. Reilly, general contractor, 6350 Fulton St., San Francisco, electrical work for post office, for Treas. Dpt. office Sup. Archt., Wash., D. C., to American Electric Co., 462 Bryant St., San Francisco*** plumbing and heating, to Scott Co., 243 Minna St., San Francisco***sheet metal, to Morris & Co., 74 Duboce Ave., San Francisco***painting, to A. A. Zelinsky, 3011 Steiner St., San Francisco***concrete, to Central Supply Co., Salinas, Calif.***reinforcing steel, to W. Wetenhall, 17th and Wisconsin St., San Francisco. Noted Jan. 3, C. D.—Jan. 9, E. N.-R. under "Contracts Awarded."

Conn., East Hartford (br. Hartford)—Barnett-Brainard Co., general contractors, 16 Van Dyke Ave., Hartford, roofing, sheet metal & brick, steel fire station, for Town. Bd. Fire Comrs., to C. G. Bostwick, 41 Francis Ave., Hartford***tile, marble, terrazzo, to Central Marble & Tile Co., 56 Sanford St., Hartford*** overhead doors, to Kinnear Mfg. Co., 294 Wash. St., Boston. Mass.***kalamein, to Waterman Eng. Co., 116 Warrenton Ave., Hartford. P.W.A. Noted Feb. 5, C. D.—Jan. 30, E. N.-R., under "Contracts Awarded."

Conn., New Britain—Michael A. Connor Co., general contractors, 15 Standish St., Hartford, excavating for brick, steel Roosevelt Junior High School, Goodwin St., for City. J. M. Welch, Bd. Educ., to J. Battaglia, 737 West Main St.***reinforcing steel, to Bethlehem Steel Co., 8th and Leigh Sts., Bethlehem, Pa.***structural steel and erecting, to Berlin Constr. Co., Inc., Berlin***iron, limestone, to Heltonville Limestone Co., Bedford, Ind.***slate, cork, bulletin and blackboards, to Hartford Cement Co., 55 Homestead Ave., Hartford. Noted Jan. 3, C. D.—Feb. 6, E. N.-R., under "Contracts Awarded."

Conn., Old Saybrook—Pieretti Bros., general contractors, Centerbrook, finish for school, for Town, G. B. Smith, Bd. Selectmen, to Loewenthal Co., 82 Berlin St., Middletown; structural steel and reinforcing steel, to Conn. Steel Erecting Co., 1043 State St., New Haven. P.W.A. Noted Feb. 28, C. D.—Mar. 5, E. N.-R., under "Contracts Awarded."

Conn., Old Saybrook—Town, G. B. Smith, Bd. Selectmen, heating for 2 story, basement, brick steel high school, to Mayflower Heating Corp., 384 Asylum St., Hartford. P.W.A. Noted Dec. 30, C. D.—Jan. 2, E. N.-R., under "Contracts Awarded."

Ga., Savannah—City, c/o Bd. Educ., constructing supplies, etc., for public schools, Unit 2, to Georgia Supply Co., $15,253***Unit 5, to Savannah Iron & Wire Wks., Savannah, $8,306*** Unit 10, to Lindsay & Morgan, Savannah, $1,074 ***Unit 12, at Savannah Public School, to Haywood Wakefield, Baltimore, Md., $9,624*** Unit 18, to Narragannset Machine Co., foot of Vale St., Pawtucket, Providence, R. I., $1,765. Grand total $36,022. P.W.A. Noted Nov. 22, C. D.

Ill., Springfield—Bd. Educ., general contract constructing McClernand School addition, to Evans Constr. Co., Illinois Bldg., Adams and 6th Sts., $65,203***Hay School addition, to F. Raywood, 1248 South Grand Ave., $74,460 ***new roof for Central High School, to Henson Robinson Co., 114 North 5th St., $12,910. Grand total $152,573. P.W.A. Bids Feb. 21. Noted Feb. 13, C. D.

Ind., Indianapolis—Wayne Twp., H. McClelland, trustees, general contract 2 story, basement, brick high school, to W. P. Jungclaus Co., 825 Massachusetts Ave., $149,904***steam heating and ventilating, to Hayes Bros., Inc., 236 West Vermont St., $38,064***plumbing, to Strong Bros., 308 North Alabama St., $18,798 ***electrical work, to Wadeford Electric Co., 205 Wacker Dr., Chicago, Ill., $6,530. Grand total $213,296. P.W.A. Bids Feb. 18, awarded Feb. 19.

Ind., Lawrenceburg—Consolidated Bd. Educ., O. M. Keller, chn., general contract 2 story, basement, 153x224 ft. consolidated high school to Roche, Connel & Laub, Shaw Ave. and Wasson St., Cincinnati, O.***steam heating, plumbing and ventilating, to G. F. Voight, 322 West Front St., Jeffersonville***electrical wiring, to Fogarty Electric Co., 946 Blair Ave., Cincinnati, O. Est. $350,000. P.W.A. Bids Feb. 3. Noted Jan. 24, C. D.

Ky., Murray—Murray State Teachers College, R. E. Broach, bus. mgr., constructing health building and home demonstration house addition to school, to Jack Cole, Paducah. Est. $263,000. P.W.A. Noted Nov. 22, C. D.

Mass., Avon—Klayman Constr. Co., general contractors, 92 Hazelton St., Mattapan, Boston, heating and ventilating for Gifford School additions and alterations, to Hobart-Farrell Plumbing & Heating Co., 26 Court St., Brockton, for Town, W. W. Littlefield, chn. Building Comm. Town Hall***electrical work, to William Gens & Son, 170 Purchase St., Boston***steam shovel excav., to Otto Theurer Contg. Co., Inc., 171 Watertown St., Watertown***light iron, to Haarmann Steel Co., Ducharme Extension, West Holyoke***interior and exterior finish, to Gregg & Son, Crown St., Nashua, N. H.***structural steel, to Groisser & Shlager Iron Wks., 84 Wash. St., Somerville***lathing and plastering, to A. Richal, Mills Rd., Needham***rockwool insulation, to Rockwool Insulation Co., 250 Stuart St., Boston***cast stone, to Bianchi Cast Stone Co., 338 Copeland St., Quincy. P.W.A. Noted Feb. 10, C. D.—Feb. 13, E. N.-R., under "Contracts Awarded."

†**Mass., Boston**—Great Lakes Constr. Co., general contractors, 333 North Michigan Ave., Chicago, Ill., painting superstructure U. S. Parcel Post Building, Dorchester Ave., for Treas. Dpt.

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†*Federal Government.*

Public Buildings (Continued)

at office Sup. Archt., Wash., D. C., to Hall Woodworking Co., 820 North Michigan Ave., Chicago, Ill. Noted Mar. 14, 1934, C. D.—Mar. 22, 1934, E. N.-R., under "Contracts Awarded."

Mass., Foxboro—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, furnishing, installing turbo-generator and switchboard in power plant at State Hospital, to Turbine Equipment Co. of N. E., 80 Federal St., Boston, $15,490. Bids Dec. 26, awarded Feb. 24. P.W.A. Noted Dec. 16, C. D.—Dec. 19, E. N.-R.

Mass., Somerset—Town, F. L. Hanson, chn. Building Comn., at office, 2 story, basement, 60x220 ft., brick, steel high school, concrete found., County St., to L. M. Witherell & Sons, 29 Court St., Taunton, $186,882. P.W.A. Bids Feb. 17, awarded Feb. 19. Noted Feb. 21, C. D.—Feb. 13, E. N.-R.

Minn., St. Peter—State Bd. Control, c/o L. G. Foley, chn., State Office Bldg., St. Paul, foundations and 1st floor for hospital at State Hospital, to Midwest Contg. Co., 652 Builders Exchange, Minneapolis, $13,762. P.W.A. Bids Feb. 11. Noted Feb. 6, C. D.

Miss., Jackson — Jackson Separate School Dist., general contract constructing Junior High School, to W. J. McGee & Son, Jackson, $270,000. P.W.A. Awarded Feb. 19. Noted Feb. 6, C. D.—Feb. 13, E. N.-R.

Mo., Rolla—Secretary University of Missouri, Jesse Hall, rejected bids Feb. 13, altering college buildings. Will readvertise. P.W.A. project. Jamison & Spearl, 1116 Arcade Bldg., St. Louis, archts. Noted Feb. 7, C. D.

Mont., Bozeman—State, c/o State Bd. Educ., E. Oreland, secy., Helena, plans 3 story, basement, rein.-con., brick student building at Montana State College, $235,000. P.W.A. funds sought.

†**N. H., Meredith**—Swanburg Constr. Co., general contractors, 61 Amherst St., Manchester, heating and plumbing for U. S. Post Office, for Treas. Dpt. at office Sup. Archt., Wash., D. C., to J. H. Stevens, 46 Manchester St., Manchester***electrical work, to Meredith Constr. Co., Inc., Meredith***roofing, to M. J. Murphy, 134 Central Ave., Dover***plastering, to M. J. McIntyre, 49 Brockton St., Manchester. Noted Oct. 15, C. D.—Oct. 17, E. N.-R.

★**N. M., Hot Springs**—State, Sante Fe, 2 story crippled children's hospital, heating plant, nurses' home, doctors' apartments, swimming pools, equipment, by day labor. $423,791. W.P.A. W. C. Kruger, Sante Fe, archt.

★**N. Y., Brooklyn**—Bd. Higher Educ., Pearl St., electrical work for academic building at Brooklyn College, to Goodrich Electrical Installation Co., 166 Lexington Ave., New York, $137,843***electrical work for science and greenhouse, to Hatzel & Buehler, Inc., 420 Lexington Ave., New York, $275,000***lighting fixtures for academic science and greenhouse and library buildings, to Simes Co., Inc., 22 West 15th St., $89,959. Grand total $502,802. Subject to P.W.A. approval. Bids Feb. 4. Noted Feb. 5, C. D.—Jan. 23, E. N.-R.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, plumbing for P.S. 247, to F. B. Lasette, 41-32 27th St., Long Island City, $20,189. Subject to P.W.A. approval. Bids Feb. 11. Noted Feb. 13, C. D.—Feb. 6, E. N.-R.

N. Y., Chester—G. Stanley Irish, general contractor, Banker Bldg., Syracuse, structural steel for school, Maple Ave., for Bd. Educ., to Syracuse Eng. Co., Everson Bldg., Syracuse; millwork, to A. Roberson & Son, Inc., Wells Ave., Binghamton. P.W.A. Noted Jan. 6, C. D.—Jan. 9, E. N.-R.

N. Y., Corfu—Dalavan Constr. Corp., general contractors, 85 Edison St., Buffalo, reinforcing steel for school, to Bethlehem Steel Co., Bethlehem, Pa., for Union Free School Dist. 7. Total est. $158,000. P.W.A. Bids Dec. 10. Noted Jan. 14, C. D.—Jan. 16, E. N.-R., under "Contracts Awarded."

N. Y., Ebenezer — C. H. Wing, Inc., general contractor, Brisbane Bldg., roofing for school, Mill Rd., for Union Free School Dist., West Seneca, to J. Draper, 241 Jewett Ave., Buffalo ***painting, to J. B. Barnes, 63 Woeppel St., Buffalo***plastering, to G. E. Hudson Plastering Co., 605 East Ferry St.***stone work, to Goodstone Mfg. Co., 470 Hollenbeck St., Buffalo. P.W.A. Noted Jan. 15, C. D.—Jan. 23, E. N.-R.

N. Y., Grand Island—Sycamore Lumber & Mill Co., general contractors, 35 Lathrop St., Buffalo, reinforcing steel for school, Base Line Rd., for Bd. Educ., to Bethlehem Steel Co., Bethlehem, Pa. P.W.A. Noted Jan. 22, C. D.—Jan. 30, E. N.-R.

N. Y., New York—Bd. Educ., 500 Park Ave., New York, heating for P.S. 107, Seward Ave., to H. Starkman & Bros., 132 Brook Ave., $102,212; plumbing, to E. Duklauer, Inc., 222 East 38th St., $27,280. Bids Jan. 31. Subject to P.W.A. approval. Noted Feb. 3, C. D.—Jan. 23, E. N.-R.

★**N. Y., New York**—Bd. Educ., 500 Park Ave., New York, general contract P. S. 113, Bronx Boro, to National Excavation Corp., 295 Madison Ave., $1,026,000; excavating, grading for Bronx Industrial High School for Girls, to Paladino & Muratore, 439 East 143rd St., $12,445. Subject to P.W.A. approval. Bids Feb. 11. Noted Feb. 3, C. D.—Feb. 6, E. N.-R.

N. Y., Poughkeepsie—L. H. Swenson & Co., general contractors, 2 Cannon St., roofing for infirmary, Maple St., for City, City Hall, to H. A. Olson, Inc., Parker Ave.***painting, to E. V. Grant, 317 Main St.***metal lathing and plastering, to Thomas Bell Co., Valatie. P.W.A. Noted Feb. 21, C. D.—Feb. 27, E. N.-R.

N. Y., Rome—A. E. Stephens, general contractor, 11 East 44th St., New York, reinforcing steel for school at Rome State School, for Dpt. Mental Hygiene, Albany, to Concrete Steel Co., 294 Washington St., Boston, Mass. Noted Feb. 11, C. D.—Feb. 20, E. N.-R.

†**N. Y., Rome**—Ross & Reid, Stone Setting Co., general contractors, 20 L St., S.W., Wash., D. C., reinforcing steel and steel forms for U. S. Post Office, for Treas. Dpt. at office Sup. Archt., Wash., D. C., to Bethlehem Steel Co., Bethlehem, Pa. Noted Feb. 24, C. D.—Feb. 27, E. N.-R.

★**N. Y., Schenectady**—Div. Military & Naval Affairs, Capitol Bldg., Albany, general contract 2 story, 147x231 ft. armory, to W. F. Hendrick Co., 1547 Northland Ave., Lakewood, O.***heating, to W. Tompkins Co., 22 Market St., Albany***plumbing, to A. J. Eckert Co., 102 North Lake Ave., Albany. Total est. $510,000. Noted Feb. 18, C. D.—Feb. 20, E. N.-R.

O., Dover—City, constructing electric power plant, Contr. 22, switchboard and switchgear, to Langanke Electric Co., Cleveland, $2,000. P.W.A.

O., Wapakoneta—City bids in April or later for electric power plant, $175,000. Burns & McDonnell, Dixie Terminal Bldg., Cincinnati, engrs.

Ore., Estacada — City Council, general contract 2 story, brick, steel high school, to Allyn & Powers, R. O. Powers, 334 Worcester Bldg., Portland, $172,684. Bids Dec. 14. Noted Jan. 6, C. D.—Jan. 9, E. N.-R., under "Contracts Awarded."

Pa., Scranton—City, constructing Junior High School, South Scranton, to Breig Bros., Scranton, $328,443. P.W.A.

R. I., Howard (Cranston)—Matthew Cummings Co., general contractors, 43 Tremont St., Boston, Mass., 350 tons structural steel for Women's Ward Buildings, to Bethlehem Fabricators, Inc., Bethlehem, Pa., for State, State House, Providence. Noted Jan. 9, C. D.—Jan. 16, E. N.-R., under "Contracts Awarded."

R. I., Howard (Cranston)—Matthew Cummings Co., general contractors, 43 Tremont St., Boston, Mass., 300 tons structural steel for group of buildings for disturbed men and women, to James H. Tower Iron Wks., 50 Borden St., Providence, for State, Emergency P. Wks. Comn., State House. Noted Jan. 21, C. D.—Jan. 23, E. N.-R., under "Contracts Awarded."

†**S. D., Sisseton**—Indiana Bureau, Dpt. Interior, Wash., D. C., constructing hospital, to H. Carlson Co., Sioux Falls, N. D., $130,610. Noted Feb. 17, C. D.

Tex., Houston—City, County Hospital c/o J. M. Nagle, dir. P. Wks., 5 story, basement, 100x160 ft., brick, rein.-con. nurses home, plain found., to J. T. Taylor, 605 1st Natl. Bank Bldg., Fort Worth, $255,755***millwork and glass, to Martin Wilder Co.***structural steel, to Alamo Iron Wks., 2000 Taylor St., Houston***reinforcing steel and mesh, to Pedan Iron & Steel Co., 700 Rothwell St.***roofing and sheet metal, to Seline Sheet Metal Works, 1021 Washington St.***terrazzo floors and base, to National Tile & Terrazzo Co., 1208 York St.***granite, to Texas Pink Granite Co., 2200 Hurley St., Fort Worth. P.W.A. Awarded Feb. 21.

Tex., Houston—Houston Ind. School Dist., c/o H. L. Mills, bus. mgr., 1 and 2 story, brick, rein.-con., cast stone addition to San Jacinto High School, plain found., to Nathan Wohlfeld, Burt Bldg., Dallas, $233,025***plumbing and heating, to O. R. Swanson & Co., 711 Leeland Ave.***electric wiring, to Jacobs Bros. Electric Co., 1014 Prairie Ave.***steel joists, to Truscon Steel Co., 731 M and M Bldg. Est. $250,000. P.W.A. J. Finger, Natl. Std. Bldg., archt.

Tex., Houston—Houston Ind. School Dist., c/o H. L. Mills, bus. mgr., classroom and auditorium addition to brick, concrete, hollow tile school, Lyons and Gregg Sts., to Kronzer Constr. Co., Merchants Exchange Bldg., $122,048***1 story, brick, stucco school additions, Woodhead and Westheimer Sts., to Russell Brown Co., 3104 Main St., $31,680*** 1 story school addition, Hazard St., to Tellepsen Constr. Co., 3800 Clay Ave., $50,112***65x91 ft. vocational shop building and Johnson School remodeling, Chenevert and Cleburne Sts., to J. M. Morgan, 611 Mason Bldg., $24,263***additional classrooms to Field Elementary School, 1811 Studewood St., to General Constr. Co., 23100 Leeland St., $42,548. Grand total $270,651. P.W.A.

Wash., Pullman—Washington State College, excavation for women's physical education and health building, to G. J. Muller & L. R. Rucker, Seattle $5,150. P.W.A. Noted Feb. 3, C. D.—Feb. 6, E. N.-R.

COMMERCIAL BUILDINGS

PROPOSED WORK

Ala., Talladega—Bemis Bros. Bag Co., 601 South 4th St., St. Louis, Mo., soon lets contract 2 story, basement, 100x140 ft., brick, rein.-con. community building. Private plans.

Ill., Chicago — St. Gregory's Church, M. Klasen, pastor, 1634 Gregory St., rejected bids Feb. 20, 3 story, 100x174 ft., brick, school, plain found., at Bryn Bawr and Paulina Sts.

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†*Federal Government*

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Commercial Buildings (Continued)

Will readvertise. K. M. Vitzthum & Co., 1 North LaSalle St., archts. Noted Jan. 20, C. D. —Feb. 6, E. N.-R.

Mo., St. Louis—Owner, c/o O. J. Popp, archt., 1528 Arcade Bldg., soon lets contract constructing brick, rein.-con. store and office building, 1231-33 North 13th St. Noted Feb. 13, C. D.—Feb. 20, E. N.-R.

★ **N. Y., Albany** — Montgomery Ward & Co., 619 West Chicago Ave., Chicago, Ill., C. J. Panco, in charge, bids about Mar. 4, constructing 5 story, mail order building addition, 250,000 sq.ft. floor area, 150 North Bway., incl. plumbing, heating, electrical work, etc. $500,000. R. R. Rowe, 610 West Chicago Ave., Chicago, Ill., archts. Noted Jan. 16, C. D.—Jan 23, E. N.-R.

N. Y., New York—Park Central Hotel, 7th Ave. and 56th St., soon takes bids altering hotel, 7th Ave. and 56th St. Est. about $140,000. Schultz & Weaver, 18 East 48th St., archts.

★ **O., Cincinnati**—Cincinnati & Suburban Bell Telephone Co., B. T. McBurney, pres., making plans constructing telephone buildings. Expenditures for 1936 total $4,000,000, of this $2,000,000 to be used for exchange additions at various locations in city, also new lines, etc.

O., Cleveland—Great Lakes Exposition Co., L. G. Dickey, genl. mgr., Terminal Tower soon lets contract constructing Hall of Progress, Horticultural and Automotive Buildings, on Lake Front, A. J. Thornin, 1906 Terminal Tower, archt. Noted Jan 22, C. D.—Jan. 30, E. N.-R.

Wis., Wausau—C. Vogel Birnwood, plans by M. Hausch, Sr., 1616 Mary St., Marinette, constructing 2 story, part basement, 90x260 ft., steel, brick resort hotel, night club, dining hall, near here.

BIDS ASKED

N. Y., Brooklyn—W. I. Hohauser, archt., 1841 Bway., New York, bids about Mar. 15, on separate contracts for home and hospital, 813 Howard St., for Brooklyn Hebrew Home & Hospital for Aged, 813 Howard St., $350,000. Noted Jan. 17, C. D.—Jan. 23, E. N.-R.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Buffalo—L. Greenstein, archt., Prudential Bldg., Buffalo, taking bids constructing home, 310 North St., for Rose Coplon Jewish Old Folks Home.

N. Y., Jamaica—See "Contracts Awarded."

N. Y., New Hyde Park—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Tarrytown—See "Contracts Awarded."

O., Cincinnati—See "Contracts Awarded."

O., Cleveland—Great Lakes Exposition Co., 1803 Terminal Tower Bldg., taking bids 1 story, 180x540 ft. frame exhibition building, H. Simpson, 7016 Euclid Ave., archt. Noted Jan. 22, C. D.—Jan. 30, E. N.-R.

CONTRACTS AWARDED

Conn., West Hartford (br. Hartford)—Wise & Upson, Inc., general contractors, 7 Forest St., Hartford, limestone for novitiate, to Indian Hill Stone Co., Bloomington, Ind., for Sisters of St. Joseph, 27 Park Rd.•••granite, to Providence Granite Co., Providence, R. I.•••millwork, to Hartford Builders Finish Co., 34 Potter St., Hartford•••tile, marble, to Dockrell, Halliday Co., Wolcott Hill Rd., Wethersfield••• structural steel, to Standard Structural Steel Co., 1014 Wethersfield Ave., Hartford•••roofing, sheet metal, to G. R. Cummings Roofing Co., 198 State St., Meriden•••steel, to Truscon Steel Co., 42 Church St., New Haven•••reinforcing steel, steel pans, to Bethlehem Steel Co., 8th and Lehigh Sts., Bethlehem, Pa. Noted Nov. 4, C. D.—Nov. 7, E. N.-R., under "Contracts Awarded."

Mo., St. Louis—Our Lady of Perpetual Help Parish, J. Wentaker, pastor, 2001 East Linton St., heating for 2 story, basement parochial school, to Heckel-Gunn Heating Co., 3085 Olive st.•••plumbing, to Cunningham Bros., 2048 La'clede Ave.•••electrical work, to C. Schaeffer, 2317 South 13th St. Noted Feb. 5, C. D.—Feb. 13, E. N.-R., under "Contracts Awarded."

N. Y., Brooklyn — Fine Homes, Inc., 153 Pierrepont St., constructing group buildings, Avenue R near Nostrand Ave., day labor and separate contracts, $140,000 or more. Seelig & Finkelstein, 153 Pierrepont St., archts. Noted Jan. 31, C. D.—Feb. 6, E. N.-R.

★ **N. Y., Eastchester** — Amortization Realty Co., c/o Murgatroyd & Ozden, archts., 285 Madison Ave., New York, constructing 6 story, basement, brick, steel apartment, plain found., Scarsdale Manor, at Garth Rd. and Buckingham Pl., in Garth Woods, separate contracts now being awarded, $800,000. Noted Jan. 10, C. D —Jan. 16, E. N.-R.

N. Y., Jamaica—Queens-Nassau Realty Liquidating Corp., c/o Lewis Land Corp., Little Neck constructing group frame dwellings, Jamaica Bay, day labor and separate contracts. To exceed $150,000. Private plans. Noted Jan 22, C. D.—Jan. 30, E. N.-R.

N. Y., New Hyde Park—Commuters Housing Corp., New Hyde Park Ave., constructing group dwellings on 500 lot site, New Hyde Park Ave., day labor and separate contracts. To exceed $140,000. Private plans. Noted Jan. 22, C. D. —Jan. 30, E. N.-R.

N. Y., New York—Framen Holding Corp., L. Gordon, pres., 1700 Harrison Ave., 6 story, brick apartment, Weeks Ave. and 175th St., separate contracts, $150,000. I. L. Crausman, 332 East 149th St., archt. Noted Jan. 29, C. D. —Feb. 6, E. N.-R.

N. Y., New York—Teakwood Realty Corp., 745 5th Ave., constructing 6 story, brick apartment, 235th St. near Riverdale Ave., separate contracts now being awarded, $140,000. T. F. Price, 2019 Anthony Ave., archt. Noted Jan. 29, C. D.—Feb. 6, E. N.-R.

N. Y., Schenectady — Walsh Bros., general contractors, 150 Hampshire St., Cambridge, Mass., limestone for church, State St., for St. Luke's Roman Catholic Church, 1202 State St., to Indian Hill Stone Co., Bloomington, Ind., granite, to J. A. Rooney Corp., 77 Summer St., Boston, Mass. Noted Feb. 7, C. D.—Feb. 13, E. N.-R., under "Contracts Awarded."

N. Y., Tarrytown—Westchester County Syndicate Corp., constructing 3rd section 5 story, basement plaza station apartments, own forces, $125,000-$175,000.

N. Y., White Plains—Corporation, c/o R. L. Fox, Wildwood Rd., Scarsdale, constructing group brick dwellings on 95 lots, Central Parkway, to Normandie Constr. Co., c/o owner. Est. exceeds $150,000. Separate contracts being awarded.

O., Cincinnati—J. Dillon, 1219 Laidlow Ave., group of dwellings (about 50), on Llanfair Ave., separate contracts and day labor. $300,000.

O., Cleveland—May Co. (Dept. Store), R. H. Gries, mgr., Euclid Ave., remodeling store, incl. bronze, glass and granite store front marquee, Ontario St., to S. W. Emerson Co., 1836 Euclid Ave.; 4 new elevators, to Otis Elevator Co., 1373 East 6th St. Est. $200,000. F. Haushka, Chester Bldg., archt. Noted Feb. 4, C. D.—Feb. 6, E. N.-R.

O., Cleveland—S. W. Emerson, general contractor, 1836 Euclid Ave., structural steel for bank and office building, for National City Building Co., 605 Euclid Ave., to Paterson Leitch Co., 900 East 69th St.; plumbing and heating, to Stamberger Co., 3113 Mayfield Rd. Noted Dec. 11, C. D.—Dec. 19, E. N.-R.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Conn., New Haven — PLANT IMPROVEMENTS—New Haven Gas Light Co., 80 Crown St., H. L. Sterrell, plans expending $108,500 for pipe, meters, service mains, plant improvements, and developments with equipment. Private plans.

Ga., Sparta—PLANT—Saylors & Massia plan wood product plant, here or vicinity. Est. about $37,000 with equipment.

Ill., Chicago—BOILER PLANT—E. E. Brooks, engr., 1892 West Madison St., soon lets contract constructing boiler plant and ash handling equipment, for Stewart Warner Corp., 1840 Diversey Blvd.

Ill., Chicago—FACTORY—Chicago Flexible Shaft Co., 5600 West Roosevelt Rd., soon takes bids 1 story, basement, brick factory, plain found., 5600 West Roosevelt Rd. S. N. Crowen & Associates, Inc., 30 North LaSalle St., archts.

Ill., Neoga—STORAGE—Watson Orchards Co. plans storage and distribution building. Est. about $37,000. Architect not appointed.

Md., Relay — WAREHOUSE — Maryland Distillery Co. soon lets contract 6 story, 131x134 ft., rein.-con. warehouse. Private plans.

Mass., Dartmouth—DAIRY—Braley's Creamery Co., Inc., A. G. Braley, pres., 3 Pleasant St., Fairhaven, soon takes bids one story, 106x106 ft., concrete, brick, steel dairy, on State Rd. To exceed $37,000. Noted Mar. 12, 1935, C. D.—Mar. 14, 1935, E. N.-R.

Mass., Salem—PLANT—Salem Electric Lighting Co., 89 Broad St., Boston, making plans furnishing, driving steel sheet piling at South River plant in Salem. F. W. Babb, 89 Broad St., Boston, engr.

Mich., Lansing — PLANT — A. Kahn, Inc., archts., New Center Bldg., Detroit, soon lets contract constructing 3 story, 131x140 ft., brick, steel, rein.-con. plant addition, plain found., on Oldsmobile Ave., for Olds Motor Wks., Lansing, $150,000. Noted Feb. 15, 1935, C. D.—Feb. 21, 1935, E. N.-R.

★ **Mo., St. Louis**—DAIRY—St. Louis Dairy Co. plans by G. W. Wolff, c/o owner, constructing dairy plant addition, 20th and Chestnut Sts., incl. machinery and equipment to be installed on same estimate to cost about $875,000, total est. $1,000,000.

N. Y., Arcade—FACTORY—K. R. Wilson Co., K. Wilson, pres., soon takes bids fireproof factory. $200,000. Private plans. Noted Feb. 7, C. D.—Feb 13, E. N.-R.

N. Y., Brooklyn — STORAGE — F. and N. Schaefer Brewing Co., 430 Kent Ave., plans by Waldemar Mortensen, 103 Park Ave., New York, altering 3 story, brick storage, 440 Kent Ave. $65,000.

N. Y., Brooklyn—MANUFACTURING—Adzan Realty Corp., L. Greenberg, pres., 114 North 6th St., plans by J. J. Furman, 952 East 39th St., 2 story, brick light manufacturing plant, 92 North 4th St. $45,000.

N. Y., Brooklyn—STORAGE, etc.—Michael & Co., 503 5th Ave., plans storage and show rooms, on premises or other location, $100,000. Architect not appointed. **Maturity indefinite.**

N. Y., Long Island City — PLANT — Safety Tire & Rubber Co., 20-20 40th Ave., plans constructing plant. To exceed $80,000. Architect not appointed.

N. Y., New York—STORAGE, etc.—William Woodward, c/o R. C. Morris, archt., 6 East 45th St., constructing 2 story, brick storage and showroom, plain found., Madison Ave. and 79th St. Est. about $90,000.

N. Y., New York—FACTORY—Ohio Match Co., L. H. Meade, vice-pres., 2 Rector St., plans constructing match manufacturing plant, here or in vicinity. Owner now selecting site. Architect not appointed.

N. Y., New York — GARAGE, etc. — Dept. Parks, Arsenal Bldg., Central Park, plans by A. Embury, 2nd, c/o owner, 1 story, 65x72 ft. brick garage and maintenance building, plan found., Bway. and Bennet Ave. $40,000.

N. Y., Niagara Falls — COAL STORAGE PLANT—Maloney Coal Co., G. A. Maloney, mgr., 805 Niagara Falls St., plans rebuilding coal storage plant, conveyor building, etc., Michigan Ave. $65,000. Architect not appointed. In market for coal loading and unloading machinery, transmission and conveying equipment.

N. Y., Niagara Falls—CARBON PLANT, etc.—Moore Research & Service Co., Inc., (subsidiary of American Sales Book Co., United Office Bldg.), bids in spring 1 story, basement, 115x185 ft., steel carbon plant and boiler house, plain found., Highland Ave. To exceed $37,000. Wright & Kremers, Main and Pine Sts., engrs. and archts. Owner will purchase 3 new boilers for same. P.W.A. project.

O., Cincinnati—GARAGE, etc.—Batsner Bros., 2716 Spring Grove Ave., soon lets contract 1 story, 137 x irregular sized brick, concrete garage and shops. $37,000 with equipment.

Tex., Mercedes—DAIRY, etc.—Cudahy Packing Co., R. E. Bradley, Texas mgr., and 221 North LaSalle St., Chicago, Ill., plans dairy and poultry processing plant, refrigeration, cooling rooms, etc. Private plans. C. H. Ruf, ch. engr., c/o owners, Chicago, Ill.

Washington — SERVICE STATION — General Petroleum Corp., 1519 Railroad Ave. S., Seattle, making plans for $10,000 service station, at E429 Third St., in Spokane; $13,500 station at 4th South and East Marginal Way, in Seattle; 2 more for unnamed Spokane sites; also installing 30,000 and 15,000 gal. tanks costing $3,000 at Spokane plant. Est. $46,500. Robert & Stewart, 1519 R.R. Ave. South, engr.

W. Va., Cabin Creek—REFINERY—Pure Oil Co., Otter Creek Rd., Toledo, O., plans refinery addition. To exceed $50,000.

W. Va., Clarksburg—PLANT—National Can Co., 110 East 42nd St., New York, plans plant improvements. $40,000.

Wis., Waukesha—PRINTING PLANT—Freeman News, 259 South St., plans by J. P. Breucker, 1581 North Prospect Ave., Milwaukee, 2 story, basement, 41x114 ft., brick, steel printing plant, plain found.

Alta., Edmonton—PLANT—Industrial Minerals Ltd., plans constructing salt refinery plant to produce 30,000 tons annually, at McMurray, 300 mi. north of here. $70,000. F. I. Batchelor, Cornwall, Ont., engr.

B. C., Quesnel—MINES—Century Gold Mines Ltd., plans mining development. $200,000.

Ont., London—FACTORY—Hygrade Products Co., 640 William St., C. Munce, mgr., plans 1 story, 150x475 ft., brick, steel factory, incl. boiler house, 4x4 ft. brick stack, 50 ft. high. Owner interested in prices complete machinery and equipment.

Ont., Sudbury—LAUNDRY—Cascade Laundry Co. making plans constructing large addition and will purchase new machinery.

BIDS ASKED

Ala., Mobile—PLANT—Rubberoid Co., 500 5th Ave., New York, taking bids general and separate contracts for plant extension (asphalt and allied products.) $200,000.

Mass., Hampden — ICE PLANT — See "Contracts Awarded."

Minnesota and North Dakota† — SUB-STATIONS, etc.—See "Contracts Awarded."

N. Y., Highland†—FACTORY—Rathgeb Knitting Mills, Inc., Milton Ave., bids in March, constructing 1 and 2 story, basement, 50x95 ft. factory addition. To exceed $37,000. E. C. Smith, 39 Market St., Poughkeepsie, archt.

N. Y., New York—MANUFACTURING, etc.—See "Contracts Awarded."

O., Cleveland — FACTORY — See "Contracts Awarded."

Tex., Brownsville—BULK OIL PLANT—See "Contracts Awarded."

Tex., Sweetwater — PACKING PLANT — See "Contracts Awarded."

Utah, Provo—COKE OVENS—See "Contracts Awarded."

Ontario — MINING DEVELOPMENT — See "Contracts Awarded."

†*Federal Government.*

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Industrial Buildings (Continued)

CONTRACTS AWARDED

Ark., Calico Rock—FACTORY—Cheese Co., c/o H. W. Wright, constructing cheese factory, separate contracts awarded. Est. about $37,000 with equipment.

Calif., Bakersfield—BOTTLING PLANT—Coco Cola Bottling Co., c/o C. H. Biggar, archt., Haberfelde Bldg., 2 story, rein.-con., 19th St., to H. Eissler, 2229 18th St., $55,000.

Calif., Long Beach—FACTORY—Spencer Kellogg & Sons, Buffalo, N. Y., linseed oil factory, incl. 67x142 ft. rein.-con. grain storage building, 8 tanks each 25 ft. diam., 77 ft. high, and steel frame warehouse with wood pile freight elevator, steel sash, metal doors, 305 Badger Ave. Est. $75,000. Owner builds under supervision of W. J. Moran, engr., 1011 South Fremont St., Alhambra. W. J. Moran, 1011 South Fremont St., Alhambra, structural engr.

Calif., Los Angeles—MARKET—J. Schenck, and United Artists Studios, 1014 North Formosa St., 1 and 2 story, 127x187 ft., rein.-con. steel market, 6th St. and Vermont Ave., to Wesco Constr. Co., 2000 Hyperion Ave. About $75,000. Noted Jan. 24, C. D.—Jan. 30, E. N.-R.

Calif., Scotia—PLANT—Pacific Lumber Co., Scotia, rebuilding 40x236 ft. bark peeling plant, to Mercer-Fraser Co., Eureka, fixed fee basis. Noted Dec. 11, C. D.—Dec. 19, E. N.-R.

Calif., Stockton—CREAMERY—Blue Ribbon Dairy Farms, 116 East Oak St., 1 story, brick, Fremont and Lincoln Sts., to T. E. Williamson, Box 93, Stockton, $50,000. Private plans.

Colorado—MINING—El Crest Mining Co., c/o H. A. Moore, Colorado Springs, constructing mining development in various locations, day labor. To exceed $100,000. Owner now purchasing materials, equipment, etc. Noted Jan. 16, C. D.—Jan. 23, E. N.-R.

Colo., Mancos—MINING—Navajo Gold Mines, Inc., c/o F. R. Holmes, Danville, Ill., constructing gold and precious metal mining development, day labor. Est. exceeds $50,000. Owner now awarding equipment contracts. Noted Jan. 16, C. D.—Jan. 23, E. N.-R.

Md., Baltimore—PLANT—Mutual Chemical Co. of America, Black and Willis Sts., plant addition, to E. Eyring & Sons, 808 South Conkling St. Est. about $37,000. Noted Dec. 24, C. D.—Jan. 2, E. N.-R.

Md., Dundalk—WAREHOUSE—Baltimore Pure Rye Distilling Co., 6 story, 120x196 ft. rack warehouse, to Cogswell Constr. Co., 406 Park Ave., Baltimore, $100,000 plus. Est. $100,000. C. H. Osborne, 222 West Franklin St., archt.

Md., Owings Mills—WAREHOUSE—Owings Mills Distillery, constructing new rack warehouse, to G. W. Jovell, Eutaw and McCulloh Sts., Baltimore, $75,000 plus. Kubitz & Konig, Emerson Tower, Baltimore, engr.

Mass., Hampden—ICE PLANT—Colonial Ice Co., 8 Cypress St., Springfield, artificial ice plant on Main St., day labor. To exceed $37,000.

Mass., Salem—FACTORY—Pitman & Brown Co., general contractors, 40 Bridge St., heating, plumbing for 2 story factory, for Parker Bros., Inc., 190 Bridge St., to F. A. Gallagher, 115 North St., Salem***roofing, to W. S. Aiken, 8 Front St.***electrical work, to Lee & Osborn, 201 Washington St. Noted Feb. 6, C. D.—Feb. 13, E. N.-R., under "Contracts Awarded."

★ **Minnesota and North Dakota** — SUB-STATIONS, etc.—Northern States Power Co., R. F. Pack, pres., 15 South 5th St., Minneapolis, Minn., new construction and improvements during 1936, incl. building substation at Nicollet Ave. and 47th St.; additional supply line from Riverside Plant to downtown dist., rebuilding high tension line between terminal substation and Long Lake, Minneapolis; increasing transformer capacity for Glen Lake and St. Louis Park in suburban district, rebuilding 8 mi. transmission line from Waconia to Watertown; building new substation and several transmission lines, improving 4 generating plants in St. Paul, rebuilding transmission line between Faribault and Mankato, and line between St. Peter and Cleveland; replacing substation at Waseca, all foregoing in Minnesota; improving steam plant at Fargo, N. D., by own forces. $3,365,000.

Miss., Greenville—PLANT—U. S. Gypsum Co., 300 West Adams St., Chicago, Ill., plant addition, to H. K. Ferguson Co., Hannah Bldg., Cleveland, O. Est. $150,000. Noted Jan. 11, C. D.—Jan. 17, E. N.-R.

Mo., St. Louis—SERVICE—Gamble Constr. Co., general contractors, 620 Chestnut St., brick work for 1 story, 60x170 ft. and 80x120 ft. central service building, for Laclede Gas Light Co., E. P. Gosling, pres., 1017 Olive St., to R. Elam, 6577 Arsenal Bldg.***cabinet work, to G. A. Hasemann & Sons Mfg. Co., 2357 South 7th St.***glazing, to Burroughs Glass Co., 305 Arsenal Bldg.***marble, to Bradbury Marble Co., 3401 Morganford St.***millwork, to Carondelet Planing Mill Co., 5826 South Bway.***smokestack, to Hummel Mfg. Co., 3010 LaSalle St.***terrazzo, to J. Pellarin & Co., 1427 Goodfellow St. Noted Nov. 13, C. D.—Nov. 21, E. N.-R., under "Contracts Awarded."

Neb., Grand Island — WAREHOUSE and GRAIN ELEVATOR — Nebraska Consolidated Mills Co., 1521 North 16th St., Omaha, warehouse, to J. Loff & Sons, Omaha, $62,250; grain elevator, to Jones Hettelstater Constr. Co., Mutual Bldg., Kansas City, Mo., $57,150. Est. $119,400.

N. Y., New York—MANUFACTURING, etc.—Ronk Holding Corp., 89 Broad St., altering manufacturing and garage, 141 East 25th St., separate contracts. Est. about $40,000. Noted Jan. 31, C. D.—Feb. 6, E. N.-R.

N. Y., New York—STORAGE—E. A. Ridley Estate, 70 Bway., altering storage, 59 Orchard St., to S. Munitz, 146 West 168th St. Est. about $37,000.

N. Y., New York—LABORATORY, etc.—Willton Constr. Co., general contractors, 157 Chambers St., 3,100 tons structural steel and steel erection for laboratory, storage and offices, 4231 Hudson St., for Royton Realty Corp., 157 Chambers St., to Post & McCord, 101 Park Ave. General Dyestuffs Corp., 230 5th Ave., lessee. Noted Jan. 15, C. D.—Jan. 23, E. N.-R.

N. Y., Syracuse — PLANT — Dawson Bros. Constr. Co., general contractors, Union Bldg., Syracuse; structural steel for warehouse and office, 536 West End Blvd., for John Morrel & Co., 111 North West St., Syracuse, N. Y., and Ottumwa, Ia., to Smith & Caffrey Co., 2611 Lodi St.***plumbing, to Burns Bros., 417 South Clinton St.***heating, to D. C. Group, 240 Erie Blvd., Syracuse***electrical work, to Krause & Heil, Inc., 624 North St., Syracuse***painting, to H. G. Masterson, 1208 Grant Blvd.***metal lathing and plastering, to B. L. Conway, 101 Columbus Ave.***roofing, to Central City Roofing Co., Erie Blvd., Syracuse. Noted Feb. 20, C. D.—Feb. 27, E. N.-R.

N. C., Gastonia—BOTTLING PLANT—Gastonia Coca Cola Bottling Co., bottling plant, to A. H. Guion & Co., Kinney Bldg., Charlotte. Est. about $40,000. Noted June 13, 1934, C. D.—June 21, 1934, E. N.-R.

O., Chillicothe—PLANT—Chillicothe Paper Co., constructing 80x100 ft. building for counting and packing operations, 61x108 ft. building for specialty operations, 40x80 ft. building to house offices, also converting present office for factory use, to Austin Co., 16112 Euclid Ave., Cleveland.

O., Cleveland — FACTORY — Gair-Cleveland Carton, Inc., c/o R. Gair Co., 155 East 44th St., New York, carton factory improvements, separate contracts. $37,000 or more.

★ **O., Toledo** — REFINERY — Pure Oil Co., Otter Creek Rd., constructing refinery addition (combination topping, cracking and reforming plant), to Lummus Co., 50 Church St., New York. Est. $750,000.

★ **Pa., Phila.**—PLANT—Crown Cork & Seal Co., Easton Ave. and Kresson St., Baltimore, Md. (1st unit), 1 story, 240x900 ft. manufacturing plant on G St. and Erie Ave., to Consolidated Eng. Co., 20 East Franklin St., Baltimore, Md., $500,000. Noted Feb. 20, C. D.—Feb. 27, E. N.-R.

Tex., Brownsville — BULK OIL PLANT — Magnolia Co., Brownsville, large and fully equipped bulk station plant. Day labor. Est. $80,000. Private plans. Will purchase steel drums, tanks, lumber, tile, etc. Noted Aug. 12, C. D.—Aug. 15, E. N.-R.

Tex., Sweetwater — PACKING PLANT — B. C. P. Pace, Sweetwater, 1 story, basement, 30x70 ft. produce, vegetable, etc., packing plant, day labor. W. R. Griffin, San Angelo, archt.

Utah, Provo—COKE OVENS—Columbia Steel Co., Provo, remodeling 33 coke ovens, day labor. $100,000. Work started. J. D. Watson, Provo, engr.

Va., Vinton—MILL—Roanoke Weaving Co., Vinton, 210x250 ft. timber mill, air conditioned, to C. W. Angle, Inc., Greensboro, N. C. Est. exceeds $50,000. Noted Feb. 24, C. D.—Feb. 27, E. N.-R.

Va., Salem—PLANT—Neuhoff, Inc., Lynchburg, constructing plant, to Martin Bros., 209 1st St. S.W., Roanoke. Est. exceeds $37,000.

★ **Wyo., Rock Springs**—POWER PLANT—Union Pacific Coal Co., constructing steam power plant in connection with company's coal properties, to Stearns-Roger Mfg. Co., 1720 Calif. St., Denver, Colo., approximately $500,000. Bids Feb. 12. Noted Jan. 20, C. D.—Feb. 6, E. N.-R.

B. C., Vancouver—PLANT—Standard Oil Co. of British Columbia Ltd., Marine Bldg., constructing fuel oil plant, 2 steel tanks with concrete fire walls, pump house, boiler house and foam house, supplying tanks, to Dominion Bridge Co. Ltd., 275 West 1st Ave.; pipe, to Crane Ltd., 540 Beatty St.

Ontario—MINING DEVELOPMENT—Newman Dick Mining & Development Co., A. Gauthier, pres., Kirkland Lake, mining development in vicinity of Kirkland Lake, day labor and separate contracts. Est. exceeds $100,000. Owner now purchasing equipment.

Ont., New Toronto—DISTILLERY—W. & A. Gilkey Ltd., 18th St., 3 story, basement, 31x100 ft., rein.-con., brick addition to distillery, plain found., to Anglin-Norcross Ontario Ltd., 57 Bloor St. W., Toronto. Est. $37,000, incl. machinery and equipment.

Que., Three Rivers—GRAIN ELEVATOR—Carter-Halls-Aldinger Co., general contractors, 51 Cherry St., Toronto, Ont., excavation for grain elevator, for Three Rivers Grain & Elevator Co. Ltd., c/o Toronto Elevators Ltd., Queens Quay, Toronto, Ont., to Kendall Bros., Inc., 1605 Iberville St., Montreal; piling, to Piling Ltd., 620 Cathcart St., Montreal. Noted Feb. 7, C. D.—Feb. 13, E. N.-R.

Federal Government.

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For official proposal advertising see Searchlight Section

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Compare: Full-force—no obstruction in waterway. Non-freezing—drains from the bottom. Inside design—eliminates surges and water hammer. Replaceable without digging—breaks above ground in case of accident. Maintenance—all parts easily removable.

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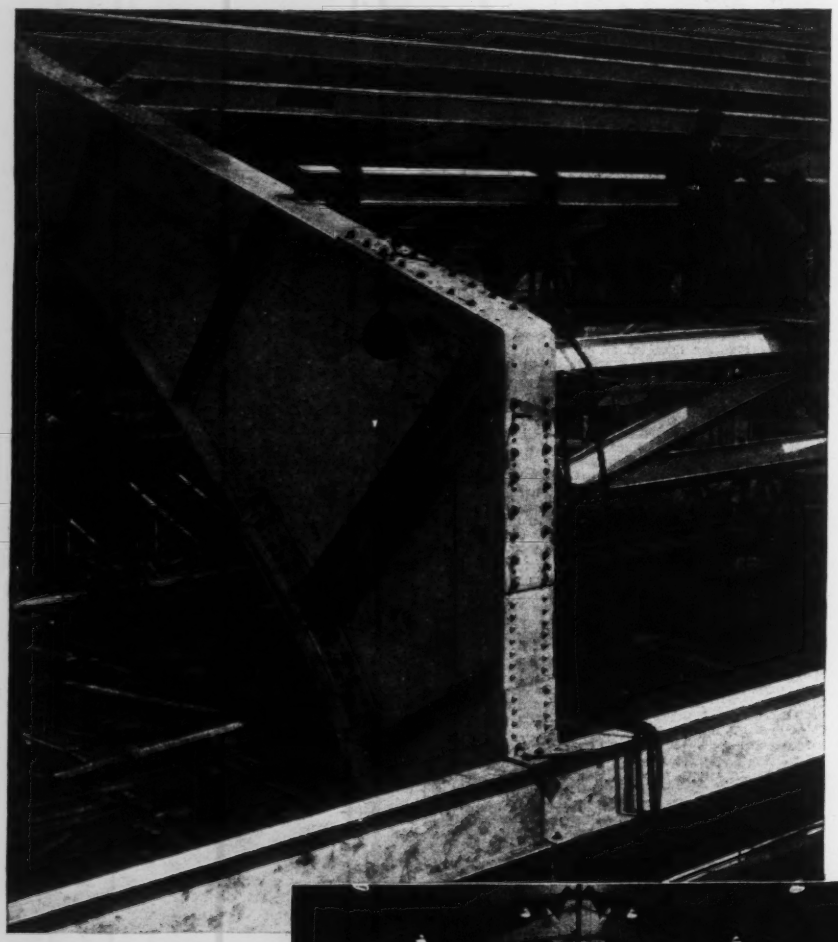

ELEVEN BEAM ARCHES *were used in the construction of this building. They were erected as three-hinged arches and so maintained until all roof steel was in place and the eave joints were riveted up. Note that the balcony, which extends entirely around the arena, is cantilevered out from the arch legs without use of hangers or struts.*

A. Epstein was the structural engineer in charge, V. McClurg co-operating. The steel was erected by Calumet Construction Company. Fabricators were Hansell-Elcock Company, Chicago.

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Notice how the unsupported span of these interesting roof members allows a clear, unobstructed view from all parts of the seating area. The span is 197 feet, the height from floor to center of arch almost 75 feet. Supporting walls are low, only 45 feet, so that costs are low proportionately. Erection was rapid. The Beam Arch spans went up at an average rate of two a day—still another factor in reducing costs, in speeding up construction.

Fabricated from CB Sections—Beam Arch roof construction offers you an economical substitute for conventional steel construction. It will simplify fabrication and erection costs. 100% sound from an engineering standpoint, it can be applied to improve appearance wherever structural steel in buildings must be exposed.

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